The Chemical Age

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NOTICES.—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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The Outlook for Chemical Markets

IF it is true—as many authorities have been asserting of late—that chemically Great Britain is gradually changing from an importing into a manufacturing nation, the conversion must be accompanied by many dependent problems. The first and most important is the discovery of markets to absorb the increased output. The home market is the first to demand attention. People who have long depended on foreign supplies are not to be converted in a moment. Quality, price, trade connections, and so on count in this matter, and the home manufacturer of new products must be prepared for a campaign in favour of home produced articles before the effects of custom and prejudice are overcome. The producers of new dyestuffs, new chemical glassware, new fine chemicals, and new chemical plant will hardly need to be reminded of the difficulties of diverting trade into new channels. It can only be done by sustained effort and by keen attention to such competitive factors as price, quality, and attractive marketing.

If the task of capturing the home market—where sentiment might be supposed to count in favour of British products—is difficult, the difficulty must be obviously greater in foreign markets, where sentiment is more neutral. And yet if we continue to produce more, we must continue to find new customers. Where are these to be found? And how are they to be captured? Naturally one looks first to our own Colonies and Dependencies. Great as these already are, they are still in their infancy. Their natural resources are almost limitless, and in the development of them chemicals, chemical plant, and chemists and engineers themselves must be employed in ever-increasing proportion. Something of all this must have dawned upon all who have seen at Wembley the riches of our Colonies in actual production, and still more in their potential resources. In these Colonial developments British capital and initiative will play a very important part, and with each development the commercial connections between home and colonial markets should become stronger and more intimate. It is not so much the present requirements of our Colonies that concern us, though already these are considerable. The real purpose is to see that in the future developments we retain our full place, and for this, present activity and foresight are essential or we may quietly slip out of sight.

Outside the Empire there are the markets offered by other nations. Here the competition is keenest, and the only basis on which we can compete is quality and price. The reputation of British goods for quality all over the world is an immense asset. When a colonial or foreign firm decides to instal a British chemical plant, for example, they know they are buying something that will function properly, last a lifetime or longer, and not require continual tinkering. We have heard of contracts given to foreign makers where, in a comparatively short period, the cost of repairs has eaten up the original difference in price, apart from the constant trouble and interruption caused in the work. It has been a real achievement to make people believe, as they are steadily coming to do, that British fine chemicals and dyestuffs can be relied on now, as British heavy chemicals and chemical plant have been relied on in the past.

Price, of course, must always bear some relation to quality. One cannot expect to buy silk at the price of cotton, nor can one expect to buy plant designed and constructed to run for half a century at the price of stuff that may be worn out in five years. Something, however, can be done in this matter by scientific costing systems, by co-operation in the purchase of raw materials, by standardisation and production in bulk, and so on. And at present the tendency is towards production at a cheaper rate not by the use of poorer materials or poorer workmanship, but by the employment of more efficient methods.

Looking at the prospects generally, we see no reason for despondence respecting the outlook before British chemistry. On the scientific side it was never so good

as to-day. The predominance of our heavy chemical branches is fully maintained against all competitors. In the field of fine chemicals there is new enterprise and gradual expansion; we are making much that was formerly not manufactured here and are better equipped for making more. The dyestuffs industry within a few years has been revolutionised in all its aspects. The science of chemical engineering is receiving steadily increasing attention, and our chemical plant manufacturers are keeping on terms with the best of their competitors. With the gradual resettlement of conditions in Europe, with some prospect at least of Russia presently returning to sanity, an increase of trade opportunities is certain, and in the competition that must ensue British chemical firms, whether manufacturing or merchanting, stand as good a chance as any of holding their own if they utilise to the full the opportunities at their command.

A Message to Chemists

THE presidential address of Dr. L. H. Baekeland to the annual meeting of the American Chemical Society is a real message from a distinguished and successful chemist to the members of his own profession. There runs through it an admirable spirit of loyalty to the Society and its work, a high and dignified view of the chemist's vocation, and abundant confidence in the future triumphs of the science. But we pass these by with a simple acknowledgment in order to emphasize an aspect of the address which deserves the thoughtful consideration of all engaged in chemical industry.

With some knowledge of the development of industrial chemistry in Germany, Dr. Baekeland is confident that in the future the most permanent chemical industries in the United States will be those in which chemists and engineers of ability play a considerable part in the general business policies. This, he hastens to add, does not mean that chemical enterprises directed exclusively by men who are chemists but who lack sound judgment or business commonsense are likely to be successful; for examples to the contrary make up the endless story of wrecks of successful ventures in the chemistry industries of every country. The danger is of another kind. Scientific thought, Dr. Baekeland reminds us, often compels intense concentration on one single subject, and to some scientists the single factor may appear of paramount importance, while other equally important factors entering into a practical problem are apt to be under-estimated. Such one-sided views may cause little harm to their author, in the publication of a book or of a scientific paper, but the man of affairs or the industrial chemist who refuses to be taught by his mistakes—as Dr. Baekeland puts it, in the American tongue—"risks to end in the poor-house."

Dr. Baekeland is not alone in the discovery that these elementary considerations are often overlooked by men of great erudition and superior intelligence who, in their career as teachers, writers, or research workers, live in a detached world of their own, made up of lecture-room, library, and laboratory. If such men, he suggests, are given opportunities "to cut their teeth on some practical problems," they may grow to be of decidedly greater service to their science and its applications. "It has been my privilege" Dr. Baekeland states in a personal testimony on the point, "to live and work amongst every kind of chemist, and I have known of very few instances where a chemist exclusively engaged in purely theoretical work did not broaden his conceptions and increase his abilities after he had been given an opportunity to deal with a practical problem. Some of the most distinguished of them only attained their full value as teachers or research men after they had become consultants on problems of applied chemistry, which taught them to grapple with hard real facts, instead of basking in the sun of self-satisfying hypothesis. Far be it from me to urge the teacher of chemistry or the investigator of purely scientific problems to sell his birthright for a 'mess of potage.' Anyone who looks in chemistry for nothing but a means of getting rich has chosen the wrong career. Undoubtedly, the present age requires specialists, but the most limited being as man or citizen is the over-specialist."

There is one other point which we cannot refrain from mentioning. Gratified by the attention paid in the United States to research, Dr. Baekeland nevertheless laments the decline of good teaching and good lecturing, though teachers who captivate their classes and arouse enthusiasm have never been very common among chemists or physicists. His complaint is of "dull and uninteresting presentation of some of the most inspiring conquests of science." Even in very elementary lectures on chemistry or physics, he finds unnecessary recourse to exclusively mathematical methods. This may make it easier for the teacher, but by lack of visualisation the very spirit of the subject is often lost on the hearers. He quotes Pasteur, Tyndall, Huxley, and Darwin, as teachers who used the simplest language when explaining science to the public. They were not afraid of making science accessible to everybody. If more scientists had followed their example, science might have had a more humanising effect on the present generation. "Whether we like it or not," Dr. Baekeland concludes, "we must adapt ourselves to the newer conditions which shape our newer duties. If not, we place ourselves in the same dangerous attitude as those Bourbons of whom it was said that 'they could not forget anything old and could not be taught anything new.'" We have tried ourselves to say something very similar. Though the terms may vary, it comes down ultimately to the old sarcasm about the two types of conductors—the one with his head in the score, the other with the score in his head.

How Good Business is Missed

THE inquiries contained in the daily editorial post-bag often set one reflecting on the amount of business lost owing to those who want to buy something being unable to get in touch with the firm or firms who supply it. We have just been going through a pile of inquiries of this order from pretty nearly all parts of the world, and they show conclusively that the prospective buyer frequently remains a prospective instead of an actual buyer because the seller has

not succeeded in introducing himself or his goods to him. We take a few examples, selected casually out of many, to illustrate the point. Here are two from widely separate points inquiring about a certain colloid mill which THE CHEMICAL AGE, we believe, first described, but of which surprisingly little has been heard of late. The inquirers are at once informed of what they want to know. Here is another about the Stream-Line Filter, and again the requisite particulars are given. A Copenhagen firm, seeing a report about the discovery of new paint and tar products by a British chemist, is anxious to get in touch with him, and we are able to supply the missing link. A Danish correspondent, studying our market reports, notes the difference between his own agent's and the British manufacturers' prices, and on being told where he can obtain the goods at the prices quoted, writes expressing his deep gratitude. A northern manufacturer desires a supply of Kieserite, but does not know where to get it; he is informed by return of post. The same day one correspondent desires the address of the Institution of Chemical Engineers and another that of the American Chemical Society; these are easy to supply. A specimen of Canadian bentonite is required by a northern chemist; a one-pound sample is obtained for him and we get a pleasant note expressing his gratitude for the trouble—which has been no trouble at all, but a pleasure. A London merchant requires the address or agents of the makers of a proprietary article. This requires some little inquiry, in which we are aided by some good American friends, and in a little while the inquirer learns that the handling firm is a not very distant neighbour.

One could easily fill a few columns in this way by merely recounting our benevolent activities in putting the anxious inquirer in touch with the people and the goods he requires. No part of the editorial function is more pleasant. All the same, it points to something missing. The firms who, at great expense, have developed valuable machines or are turning out new products have somehow not succeeded in making themselves and their goods known to the buyers who are interested in both. And the result is that good business is missed—how much, heaven only knows. The faith of our correspondents all over the world in our ability to put them on the right line of inquiry is flattering, but it indicates a gap somewhere in the organisation of the vendors themselves. That something, in our opinion, is well-selected, continuous publicity in live contemporary publications which are read by all sorts of people the firms do not know. By post they may perhaps reach the obvious people, who know all about them already—with the excellent prospect on the one hand of missing the unknown customers or of having, in the case of those they know, their carefully prepared pamphlets, etc., waste-paper-basketed by junior clerks. Or, excited by glowing yarns, they may put their announcements in some new and expensive "stunt" publication, where they will be safely interred for a twelve-month. The live newspaper, on the other hand, gets not merely to the people the advertiser has thought of but to those whose existence he has never known of or even suspected. And it is from this unknown land that the new business generally comes.

Points from Our News Pages

Part II of Dr. F. G. Cottrell's survey of the nitrogen fixation problem deals with cyanamide developments, catalyst and promoter problems, temperatures and pressures and other points (p. 310).

A summary of the presidential address of Dr. Baekeland, president of the American Chemical Society, is published (p. 313).

Special trade articles deal with chemical markets in the Far East, the packing of acids for export, and production statistics of British chemicals (pp. 314–17).

Fire-fighting equipment for chemical works is described in an article by Hartland Seymour (p. 320).

No material change is reported in the London chemical market; the outlook for business, however, is broadening and prices tend slightly downward (p. 332).

In the Scottish chemical market improved conditions are reported (p. 335).

Book Received

QUALITATIVE CHEMICAL ANALYSIS. By Henry W. Schimpf. London: Chapman and Hall, Ltd. Pp. 201. 8s. 6d.

The Calendar

Sep. 13 to Oct. 25	Royal Photographic Society of Great Britain: 69th Annual Exhibition.	35, Russell Square, London, W.C.1.
Sep. 29 to Oct. 1	British Commercial Gas Association: Thirteenth Annual Conference.	Liverpool.
1	Society of Public Analysts: "The Determination of Coconut Oil and Butter Fat in Margarine," by G. D. Elsdon and Percy Smith, and other papers by F. Knowles and J. C. Urquhart, Miss W. N. Nicholson and D. Rhind, Miss M. B. Richards and W. Godden, and W. S. Shaw. 8 p.m.	Chemical Society's Rooms, Burlington House, London.
2	Society of Chemical Industry (Bristol Section): Joint Meeting with local Section of the Institute of Chemistry: "Combustion Control in Boiler Houses." H. T. Ringrose. 7.30 p.m.	The University, Woodland Road, Bristol.
3	Society of Chemical Industry (Manchester Section): "Science and Industry." W. J. U. Woolcock. 7 p.m.	Manchester.
7	West Yorkshire Metallurgical Society Annual General Meeting, 7.30 p.m.	George Hotel, Huddersfield.
8	Liverpool Chemists' Association: "The Chemistry of Food." Dr. W. J. Melhuish.	Liverpool
16	Chemical Society. Ordinary Scientific Meeting. 8 p.m.	Burlington House, Piccadilly, London.
22	Faraday Society, Geological Society, and the Mineralogical Society: General Discussion on "The Physical Chemistry of Igneous Rock Formation." 3 p.m.	Burlington House, Piccadilly, London.
Nov 4	West Yorkshire Metallurgical Society Discussion on "The Influence of Casting Temperatures on the Physical Properties of Non-ferrous Alloys." 7.30 p.m.	George Hotel, Huddersfield.
6	Society of Chemical Industry (Bristol Section): Joint Meeting with local Section of the Institute of Chemistry: "The Present Position of the Geber Problem." E. J. Holmyard. 7.30 p.m.	The University, Woodland Road, Bristol.
14	Society of Chemical Industry and Chemical Industry Club: Joint Autumn Dinner	London

The Problem of Nitrogen Fixation.—(II)

By Dr. Frederick G. Cottrell

In the second instalment of Dr. Cottrell's survey of the nitrogen fixation problem, he deals, among other points, with developments in connection with the cyanamide process, progress in the study of catalysts and promoters for use in the direct process, and the problem of temperatures and pressures. The concluding instalment will appear next week.

THERE is one more source of hydrogen already mentioned whose importance in determining the form which the fixed nitrogen industry will eventually take must not be overlooked. This is the extraction of hydrogen from the gases of by-product coke ovens. There is enough free hydrogen in the coke oven gases of the United States to fix over fifty times the country's present consumption of nitrogen in all commercial fertilizers. There are, for example, more than a dozen single coke oven installations from the gases of any one of which enough hydrogen could be extracted to fix the forty thousand tons of nitrogen representing the present capacity of Plant No. 2 at Muscle Shoals. This hydrogen can be separated from the coke oven gases by liquefaction and distillation much as gaseous nitrogen is separated from the air at Plant No. 2. This whole field of low temperature gas liquefaction and separation presents wonderful economic possibilities, which engineers are just beginning to realize, and its further development is bound to be of tremendous importance in a number of applications to the nitrogen industry.

This happens to be one of the cases where we have had a large scale of development, spent a great deal of money getting it started, and then had to suspend operations and go back into the laboratory to work up the next steps on which to build further. We may with advantage, therefore, turn from the plants at Muscle Shoals to the work of the Fixed Nitrogen Research Laboratory at Washington. This was established by the Secretary for War in March, 1919, and was intended primarily to carry on various lines of research commenced in connection with the Muscle Shoals projects and particularly to study possible improvements in these plants and their adaptation to peace time purposes. It has a staff of approximately seventy-five, about half of whom are chemists, physicists, and engineers. Its annual expenditures are something over two hundred thousand dollars.

The first major problem confronting the laboratory was naturally to determine what recommendation should be made with regard to Plants No. 1 and No. 2 respectively, in case it was decided to put either or both into operation under either Government or private auspices.

Cyanamide Developments

As Plant No. 2 was in thorough operating condition, and the chances for any radical improvement in the process or equipment seemed extremely doubtful, the chief effort as regards this plant was directed toward better methods of utilising its products. With power at two mills per kw. hr., it was estimated that this plant, if run at full capacity, could make cyanamide at a cost of nine cents per pound of nitrogen fixed, which is decidedly below current prices of nitrogen in other forms, but unfortunately cyanamide can only be used in very limited quantities in our present fertilizer practice because, when mixed in larger proportions with superphosphate, which is the backbone of the present fertilizer industry, it not only causes reversion of part of the phosphate to insoluble forms, but is itself also converted partly into dicyanodiamide which has, when present in sufficient quantity, distinctly toxic action on plant growth. On the other hand, if the cyanamide must be converted into ammonium sulphate, little, if any, margin of saving would be left as compared with present prices.

This leaves two lines of approach—(1) new outlets for cyanamide itself, (2) new and cheaper methods of converting it into other products which can be used freely in our general fertilizer practice. Under the direction of Dr. Joseph M. Braham, Chief of the Chemical Division, progress is being made along both of these lines. He does not expect this, however, to threaten the growing supremacy of the direct synthetic ammonia process where new plants are concerned. The most promising new outlet for cyanamide seems to be in mixtures with basic slag or "calcined" phosphate, especially for use on certain crops like corn, which seem especially well able to utilize such mixtures. The conversion to other compounds is perhaps best illustrated by urea, in whose preparation from cyanamide considerable progress lately has been made. But with the cyanamide nitrogen itself at the nine cent level to start with, the possible margin for further economic conversions is, of course, limited and as we shall see later, the chances for getting nitrogen fixed at considerably less than nine cents through the direct synthetic ammonia process are now so good that a permanent resuscitation of the cyanamide process for fertilizer purposes seems practically out of the question.

Cyanamide a Possible New Starting Point

It is interesting to note, however, in this regard that cynanamide may one of these days very well furnish the starting point for a whole new series of important nitrogen compounds, just as coal tar did for the dye and medical field, but even so, the tonnage of coal tar derivatives is insignificant compared with that of fertilizers, and a very few of the now existing cyanamide plants would probably suffice to supply all the raw material which it is easy to imagine such an industry consuming.

If, however, in considering Plant No. 2, we do not limit ourselves to the cyanamide process, then greater possibilities may eventually unfold. The equipment for the cyanamide process is largely typical of what has generally been proposed for fixing nitrogen through many of its other compounds with both metals and metaloids. While many such processes have been not only suggested, but patented, none of them has yet proved commercially practicable for fertilizer production. However, there seems no fundamental reason why some such process may not yet appear and successfully contend for the field with those now dominating it.

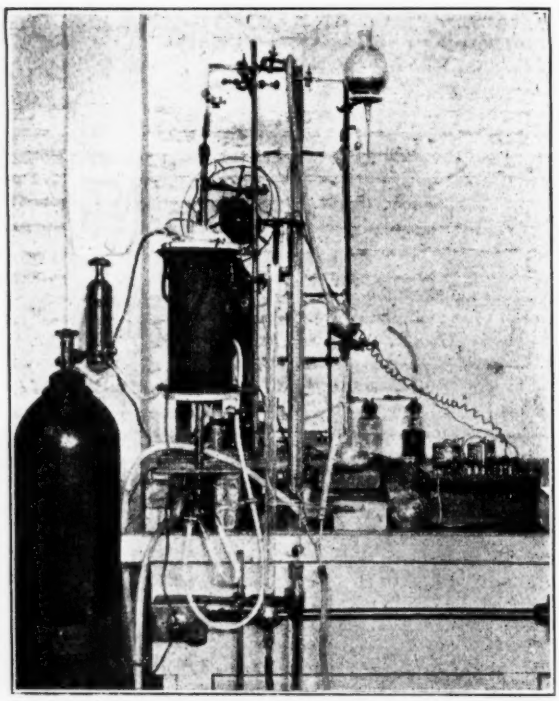


FIG. 5.—ARRANGEMENT OF APPARATUS FOR WORK ON THE ALUMINUM NITRIDE OR SERPEK PROCESS.

Perhaps the best case for the purposes of illustration is the aluminum nitride or Serpek process in its various forms, especially in those where it has been proposed to make the procedure followed serve the double purpose of fixing nitrogen

as ammonia and securing a pure alumina from crude or even low grade bauxite.

Work of this character with regard to various metallic and non-metallic nitrides, cyanides, and similar compounds has been conducted at the laboratory from time to time as new clues or promising suggestions developed. Fig. 5 shows a typical set-up for such work. In this particular case it had to do with determining the mechanism of the reaction by which alkali cyanides are formed, when carbonate of soda or potash is heated with carbon and a little iron in a current of nitrogen. This reaction has been known for many years and came into prominence during the war under the name of the Bucher Process. The Government erected an experimental plant based on it at Saltville, Virginia, which was dismantled after the war. The process has since been developed by private capital and is in commercial operation in California for the production of hydrocyanic acid used in fumigating orange and other fruit trees.

While cyanides can be hydrolized with steam in much the same manner as cyanamide to produce ammonia, the cost of making fertilizer by this route is at present too high to compete with other methods. It has long been known, however, that cyanides are formed in the lower portion of the iron blast furnace, where they are vaporized and carried up with ascending gases only to be reoxidized with liberation of their nitrogen in the upper part of the furnace. It has been proposed to tap off a part of the gases from the bosh and collect these cyanides, but we need much more complete and accurate

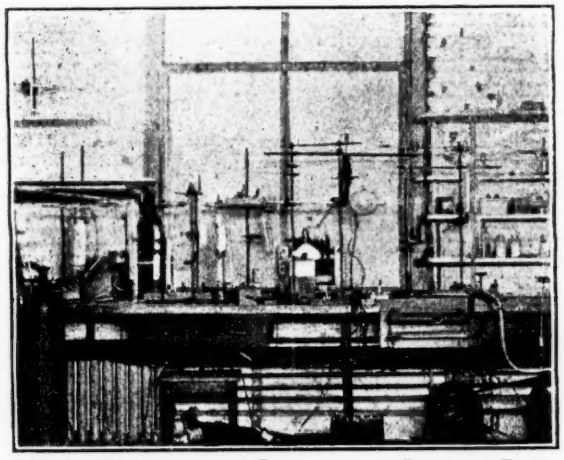


FIG. 6.—EQUIPMENT FOR STUDYING THE CHEMICAL REACTIONS OF "ACTIVE NITROGEN"

information before even a fairly good guess can be hazarded as to the economic possibilities of such a process, especially if ammonia for fertilizer is its ultimate aim. The laboratory is at present co-operating with the Bureau of Mines, and one of the iron companies of the South in a rather comprehensive series of experiments at one of the latter's blast furnaces. If such a method of fixing nitrogen should prove practical it might have a very important influence on the whole industry.

Another interesting line of investigation going on at present in the laboratory, under the direction of Dr. Sebastion Karrer, Chief of the Physics Division, is what might be called the dissection of the arc as used in the old arc process. In an arc we have, of course, the possibility of at least three kinds of phenomena all going on at the same time, viz., thermal, electrical, and photo-chemical. The practical results as regards nitrogen fixation which we get from the arc can fairly well be explained on a purely thermal basis, *i.e.*, as due merely to the heating effect of the current followed by sudden chilling, but this by no means proves the absence of specifically photo-chemical and electrical phenomena, which might be of the greatest importance if they were not masked by the thermal effect.

Chemical Reactions of "Active Nitrogen"

One thing we are trying to do is to isolate these three types of phenomena and study them separately, especially the electrical and photo-chemical. Fig. 6 shows a part of this work under way. It is equipment for studying the chemica reactions of so-called "active nitrogen" discovered some twenty years ago by E. P. Lewis in Berkeley, California, and later studied in considerable detail by R. J. Strutt in Cambridge, England. Nitrogen is drawn from the steel pressure cylinder on the extreme left through the apparatus by the vacuum pump at the lower right hand corner. On its way it passes through a train of purifiers including coils cooled in liquid air, pressure and flow regulating valves, flow meters and a discharge tube in which an alternating electric discharge is taking place, usually at about a thirtieth of an atmosphere. Thence it passes out through the long horizontal glass tube into the glass globe of a litre capacity and on through another bath of liquid air to the pump. Provision is also made to bring into the globe other gases, either in their normal condition or after similar passage through a separate discharge. The most striking characteristic of the active nitrogen is the intense yellow glow it gives off for the better part of a second after leaving the discharge tube or after interrupting the discharge. It also reacts energetically with many substances toward which ordinary nitrogen is wholly inert, but the bulb, though filled continuously with the glowing gas, remains essentially at room temperature, thus showing that we have succeeded in leaving at least the great part of our thermal phenomena behind and can now address ourselves to the task of further analysing what is left. This latter work is already well under way from both a chemical and a physical standpoint, and runs into much more difficult and complicated equipment than that here pictured. But this initial step illustrates how the complicated phenomena met with in actual works practice must be dissected when taken into the laboratory.

Research in the Direct Process

Let us turn to the work of the Laboratory in the field of the Direct Synthetic Ammonia Process, as it seems there that immediate commercial development is most justified and the Laboratory is prepared to present a definite programme with detailed plans for such work.

On closing down the work at Plant No. 1 after the war, it was generally felt that both the engineering and the chemical features of the project needed thorough overhauling, and work was accordingly started on both these lines. The first had to do with a sufficient redesign of the physical equipment to overcome the mechanical difficulties already encountered. The other consisted of an intensive laboratory study of the process itself, with special regard at the outset to determine the best ammonia catalyst and satisfactory methods of preparing it, as this had been one of the more outstanding troubles from the chemical side.

The engineering redesign of the plant stretched over about two years, being completed in the fall of 1921. It was estimated that to carry it out for one unit representing a quarter of the full capacity of the plant would cost about one million dollars. This did not contemplate any very radical changes in the process as such, nor the employing of any higher pressures than the one hundred atmospheres forming the upper limit for which the plant was originally designed.

Ammonia Catalyst Experiments

On the chemical side the heart of the process is naturally the ammonia catalyst. The phenomena which here take place are the most sensitive to the effect of impurities as well as the most obscure in their mechanism. The discovery and selection of catalysts had from the first to depend essentially upon empirically testing out each substance, be this an element, a compound, or a mixture. The periodical and patent literature mentions some twenty-five metals as capable of accelerating the NH_3 reaction. Of these, Haber's pre-war publications stressed osmium and uranium as the best known catalysts for this reaction, and compared other substances to these as standards. There was, however, in the pre-war literature little by way of useful suggestions in the selection of a practical catalyst.

The large scale plans and efforts at Plant No. 1, up to the time of its shut-down after the war, were wholly based on the use of sodium amide as the catalyst, supported on an argilacious base. Its great disadvantage lay in its extreme sensitiveness to the least traces of moisture and other impurities in the gases, and in its gradual action on the supporting base. The experience with it emphasised the need of a catalyst which would not be destroyed by traces of moisture and other gaseous

impurities. From this point of view, metals whose oxides were readily reducible in hydrogen offered the most promise. Many of these were investigated during the war in British, French, and American laboratories, but the results were not very promising. Probably the best combination found by these laboratories consisted of a mixture of equal parts of iron and molybdenum.

When the Fixed Nitrogen Research Laboratory took up this work after the war, further investigation of the iron-molybdenum type of catalyst was made. At the same time considerable attention was given to the action of pure iron. A method for preparing highly porous and at the same time hard and coherent granules of iron oxide had been developed during the war by the Research Division of the Chemical Warfare Service. Preliminary experiments gave very promising results for iron made by the reduction of an oxide prepared in this manner.

Promoters

Up to the close of the war, very little work had been done outside of Germany on the activation of catalytically active metals by the admixture of relatively small percentages of apparently inactive materials. It was generally known that the action of catalysts was modified by admixture of other materials. The German patent literature had suggested numerous substances, designated "promoters," which it was claimed could advantageously be added to catalytic metals such as manganese, cerium, osmium, cobalt, and iron. There was nothing in the literature, however, to indicate which catalyst was the best and which promoter would give the highest activation. Since iron had given us such promising results it

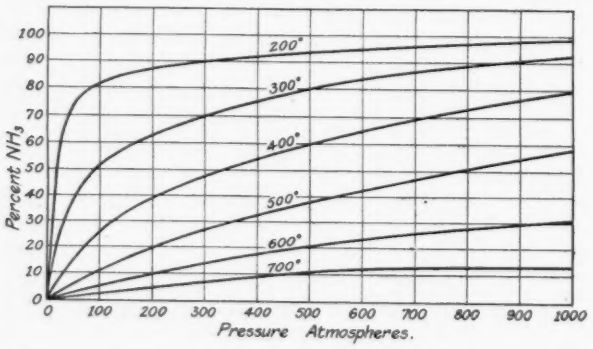


FIG. 7.—CONCENTRATION OF AMMONIA IN EQUILIBRIUM WITH ONE-TO-THREE MIXTURE OF NITROGEN AND HYDROGEN

was natural that our study of promoter action was begun on that metal. Our experiments soon showed that the indiscriminate selection of any one, or more, of the promoters which had been suggested in the literature did not give good results. We found that the best results were obtained when two promoters were added to the iron. One of these was always strongly basic in character, while the other was markedly more acidic. Thus, for example, when a basic oxide such as potassium or caesium oxide and a more acidic oxide, such as aluminum oxide or zirconium oxide were added to the iron, excellent results were obtained.

It must not be thought, however, that the problem of ammonia catalysts had been solved when a successful combination of promoters had been discovered for the iron. There yet remained the more difficult task of adapting such a catalyst, its method of manufacture, and its utilisation to the needs of a technical process. In fact the biggest job came after satisfactory combinations and modes of preparation had been discovered, for it was then necessary to determine the relative efficiency and longevity of each under a wide range of working conditions, including variations in pressure, temperature, and purity of gas mixture.

Temperatures and Pressures

Fig. 7 shows in graphic form, for various temperatures and pressures, the concentration of ammonia which would be in true chemical equilibrium with a one-to-three mixture of nitrogen and hydrogen. In other words, these are the concentrations of ammonia which a theoretically perfect catalyst would bring about if the gases were passed through it slowly enough to let it complete its work. In practice it pays better because of larger daily production to pass the gases through much more rapidly and be content with only a partial approach to equilibrium. Present commercial practice probably reaches on the average only about fifty per cent. of the equilibrium value. The curves clearly show why it is so important to develop catalysts which will work under conditions of commercial operation at the lowest possible temperature. No particular difficulty is met with in finding a catalyst if one is to operate at say 550° to 650° C., a range over which much of the commercial development and operating has in the past probably been done, but to reduce this another hundred degrees puts very severe requirements on the catalyst. While with these better catalysts ammonia may still be slowly formed at temperatures down around 300° C., the practical lower limit for ordinary commercial operation with the best catalyst now available may perhaps fairly be taken as about 450° C.

As an interesting measure of progress, though one on a purely academic basis, it may be mentioned that when Haber determined the equilibrium values for this reaction over a decade ago, the best catalysts he could then command allowed him to go only to 561° C. while with those prepared in our laboratory similar measurements have recently been extended down to 325° C[1].

The data thus collected form the basis for the careful study of the best operating conditions not only as regards selection among the possible catalysts, but also as regards pressures, temperatures, and even methods of gas preparation and purification, thus fundamentally determining to a very large extent every other feature of the process and the equipment.

For instance, in the matter of increasing pressures one might think that this would be a question almost wholly governed by purely structural factors, such as strength of the apparatus, cost of gas compression, etc., but we find as a matter of fact that some catalysts, which are quite satisfactory at low pressures, fall off rapidly in their efficiency as the pressure increases, while others stand up under these conditions far better.

With change of pressure, on the other hand, the relative ease and efficiency of the various methods of gas purification before catalysis and of ammonia removal after catalysis, shift, and so we have in effect a set of simultaneous equations, as it were, with a large number of variables. Some of these latter can be given numerical values and eliminated by the ordinary processes of algebra, but we always have left that important and irreducible residue, which must finally be handled by the application of common sense.

Examples of such are the factors of safety and the tolerances to be allowed in the design of equipment, and questions as to whether a given adjustment should be left to the control of the operator, or fixed at some average point once for all, and built more or less permanently into the apparatus itself. It is on just such points as these that the habit of thought in the laboratory and in the large scale operating plant must necessarily differ, and their final co-ordination depends upon the common sense of those in responsible charge.

Considerations of this nature have led us to extend our work at the Laboratory well into the field of practical engineering, in order to make sure that the results we were attaining should efficiently connect with industrial conditions when the time came for their utilisation. Our Engineering Division, in addition to its responsibility for the engineering features of the laboratory's experimentation, has been able to render very material serivce in an advisory way to a number of the present and prospective manufacturers of synthetic ammonia in this country, some of whom are constantly co-operating with us on the design and development of new equipment.

Importation of German Chemicals

WITH regard to the summons heard recently at the Mansion House Police Court, in which fines were imposed on Mr. A. C. Henry, in respect of alleged false declarations of the value of imported phenacetin (reported in THE CHEMICAL AGE, August 16), we understand that it is not now Mr. Henry's intention to appeal against the decision of the magistrate. We are also informed that an arrangement has been come to with the Customs authorities in connection with the other summons referred to, against Mr. Henry and Mr. Lionel Cooper jointly, on a similar charge, the hearing of which was postponed pending the result of the appeal on the first summons.

Prospects and Retrospects in Chemistry

By Dr. L. H. Baekeland

Dr. L. H. Baekeland's Presidential Address at the Annual Meeting of the American Chemical Society contained a number of interesting points on the development of the chemical industry in that country, and its possible expansion in the future.

Dr. L. H. Baekeland referred first to the membership of nearly 15,000, a number far exceeding that of any other chemical society in the world. The scope of their publications had largely increased also. In addition to the original *Journal*, now devoted to theoretical matters, in 1906 they had started the *Journal of Chemical Abstracts*, which made them the only nation independent of the German *Chemisches Zentralblatt*. In 1909 *Industrial and Engineering Chemistry* was started, and had been lately reinforced by a bi-monthly supplement known as the "News Edition." There were also the chemical monographs published in book form, and more recently, the *Chemical Review*. These formed an imposing list of publications, many of which had acquired such international importance that no chemical library could be considered complete without them.

Referring to the development of chemistry in the States, largely through the activities of the A.C.S., Dr. Baekeland said that the period when Americans were compelled to go abroad to study chemistry had long since passed. "It was quite natural," he continued, "that the United States should have had to evolve through the same phase through which Germany had to pass, when in 1822 Liebig had to travel to Paris and study chemistry there under Gay-Lussac, Dulong and Thenard. Later on, the disciple himself became a master in his own country. But the great development of chemical science and chemical research which followed in Germany would hardly have been possible but for the new favourable conditions brought about by the early manufacture of synthetic dyes in that country after the original discovery of Perkin in England."

Need for Business Sense in Chemistry

Speaking of the future in the United States, Dr. Baekeland said, "I believe the most permanent chemical enterprises will be those in which chemists and engineers of ability play a considerable part in the general business policies. This does not mean that chemical enterprises directed exclusively by men who are chemists, but who lack sound judgment or business commonsense, are likely to be successful. Examples to the contrary make up the endless story of wrecks and unsuccessful ventures in the chemical industries of every country. Some of the most exalted names in chemical science have been connected with such defunct enterprises.

"Scientific thought often compels intense concentration on one single subject, one single factor of a many-sided problem. To some scientists that single factor may appear of paramount importance, while other equally important factors entering into a practical problem are apt to be underestimated. Any such one-sided points of view may cause little harm to their author in the publication of a book or of a purely scientific paper, even though sometimes they result in stubborn scientific polemics. Stubbornness in purely scientific points of view is not always easily cured and sometimes clings like a dogma; but the man of affairs or the industrial chemist who refuses to be taught by his mistakes runs the risk of ending in the poor-house.

"These considerations, simple as they may be, have not infrequently been overlooked by men of great erudition and superior intelligence who, in their career as teachers or writers or research workers, were able to live by themselves in a world confined by their lecture room, their library and their laboratory. If such men are given opportunities to cut their teeth on some practical problems they may grow to be of decidedly greater service to their science or its applications.

School of Practical Experience

"It has been my privilege," said Dr. Baekeland, "to live and work amongst every kind of chemist, and I have known of very few instances where a chemist exclusively engaged in purely theoretical work did not broaden his conceptions and increase his abilities after he had been given an opportunity to deal with a practical problem. Some of the most distinguished of them only attained their full value as teachers or research men after they had become consultants on problems of applied chemistry which taught them to grapple with hard, real facts instead of basking in the sun of self-satisfying hypothesis. Far be it from me to urge the teacher of chemistry or the investigator of purely scientific problems to sell his birthright for a 'mess of potage.' Anyone who looks in chemistry for nothing but a means of getting rich has chosen the wrong career. The same efforts would lead him sooner to that goal by following more direct money-making pursuits which do not require such a long and difficult preparation.

"All these considerations point to another phase of the great mission of the American Chemical Society, by its drawing together of all chemists in whatever different lines of work they may be engaged. Undoubtedly, the present age requires specialists, but the most limited being as man or citizen is the over-specialist.

"The gospel of research has now been so well preached in the United States for many years that to-day no other country spends so much money and effort along these lines in industrial as well as in educational and special research institutions. On the other hand, I wonder whether our efforts towards good teaching, good lecturing on chemical subjects, have not relaxed somewhat. Teachers who captivate their classes and arouse enthusiasm for their subject have never been very common among chemists and, I should add, physicists.

"Dull and uninteresting presentation of some of the most inspiring conquests of science occur too frequently. Even in very elementary lectures on chemistry or physics unnecessary recourse is frequently made to exclusively mathematical methods which makes it easier for the teacher, but by lack of visualisation the very spirit of the subject is often lost upon his hearers. Pasteur, Tyndall, Huxley and Darwin used the simplest possible language when explaining science to the general public. They were not afraid of making science accessible to everybody. If more scientists had followed their example, science might have had a more humanising effect on the present generation."

Science a Constructive Agent

Though science was blamed by ignorant people for all the horrors of modern war, we must not for this reason lose faith in the noble purposes of our real mission. At the recent meeting of the British Association for the Advancement of Science one of Britain's most distinguished physicians stated that every town in the world owed a statue in gratitude to Pasteur, the great French chemist. The rôle of chemistry was essentially constructive; to make this world more comfortable, happier and better to live in, to elevate the human race. Never had our field along those lines been more promising than to-day. He was not one of those who tended to exaggerate the benefits of chemistry in the creation of thousands of new synthetic dyes, except for the enormous fund of new chemical knowledge we had gathered thereby and which has helped immensely in other more valuable directions. In the meantime our fickle and over-dyed world now seemed to have been supplied abundantly enough. Incomparably more promising fields beckoned us to better endeavours. Amongst those fields none were more inspiring than that of the biochemist. Biochemistry, one of the younger branches of our sciences, had been confronted by many handicaps and its progress had been necessarily slow. It was still harassed by great experimental obstacles, but the newer revelations, technique and methods of other departments of science were now being used there to excellent advantage. Lately the study of the chemistry of endocrine glands seemed to open the most startling possibilities.

In conclusion Dr. Baekeland said: "If our predecessors in science scarcely ventured to foresee the realities of the present in what were then called visions or idle dreams, what dreams of the future may we indulge in if the mere chemical functions of some glands may make a man good or bad, strong or feeble, intelligent or stupid, peevish or happy, courageous or cowardly, generous or greedy? Shall the biochemist become gradually a factor in the elimination of our houses of correction, our poor-houses, lunatic asylums, as well as in the organisation of our educational institutions? Who knows?"

Chemical Markets in the Far East

Our Relation to Other Competitors

The following review of Far Eastern chemical markets specially prepared for THE CHEMICAL AGE *indicates that local conditions vary enormously throughout countries overseas, and specialised attention to individual markets is necessary if exporting business is to be fostered along the right lines.*

THERE are several directions in which the export chemical trade has done good business during the past year, mainly as exemplified in the Dominion countries, through connections established by an increasing number of suppliers from this country, and this brings out in contrast the position in remote markets where activities are in the hands of a remarkably small number of firms. Nevertheless, these exporters, it should be noted, have withstood successfully competition from other countries even when at a relative disadvantage in respect of distance from the market, and reports emanating from leading world manufacturers give much reason for satisfaction in their remarks concerning the confidence with which our products are handled in the markets of the Far East.

Portions of this field have been extensively surveyed by agents from U.S.A., and there is little doubt as to the strength of present demands for chemicals and the potentialities which can be anticipated, in view of the increasing investments in the primary productions of these countries. Dominant products of this trade direction, which embraces the tropical countries of Java, Sumatra and British Malaya, are tobacco, sugar and rubber, all of which are being developed by improving standards of cultivation and constitute demands for a wide range of chemicals. That general growth in plantation prosperity is continuing in Java is the view of the local representative of the Federation of British Industries, and as regards future business an exceedingly optimistic note is sounded.

Tangible confirmation of this is to hand in the most recent statistics, which show the prominent position which Java is assuming in the chemical trade, so that this country is even now one of our most important customers for sulphate of ammonia and the British position in this commodity is now well established. During the last recorded year some 28,000 tons of sulphate were imported from the United Kingdom, and this represented a value approaching £43,000.

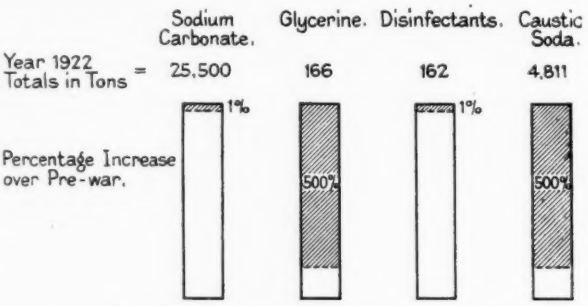
Strong Demands for Fertilisers

As evidence of the importance attaching to this trade one of the leading concerns in the sugar industry known as the Suiker Proefstation Van Oost Java, estimates that sugar cultivation alone requires 60,000 tons of ammonium sulphate each year, and throws out an interesting opinion in regard to local conditions that this kind of fertiliser is far more suitable for their industry than any other, considerable labour being required to work other varieties into the soil. Generally speaking, planters buy from importers on the basis of a 25 per cent. ammonium content with a stipulation that the sulphate should be free from sodium and containing not more than 1 per cent. free sulphuric acid. Since the war the largest annual imports recorded were above 110,000 metric tons, and the proportion taken from the United Kingdom was in the vicinity of 27 per cent. Basic slag, known locally as Thomas dust, is also used to a considerable extent in the tobacco fields of Sumatra, and requirements are here best met when the slag is milled as fine as flour in order to sow by machinery. General reports indicate that with the fertiliser a content of 15 per cent. phosphoric acid is desirable.

Including Sumatra, the Dutch East Indies offer an exceedingly valuable market for all chemical manures, and increasing imports during the past year are reported as having been favourable to British manufacturers. The c.i.f. quotations from the United Kingdom have been quite competitive, and it is a satisfactory feature to note the progress of inquiries by home manufacturers who have not hitherto done business in this direction. Heavy chemicals are in growing demand, but fine chemicals and photographic materials are developing trade connections. Sulphuric acid during the last recorded period did not do so well as formerly, reaching only a total of 340 tons as against more than 1,000 tons of the preceding year. Caustic soda gives promise of enduring demand, and the market for this product is also worthy of greater attention in view of the sustained expansion to be seen during the last three years. In the twelve months of 1921, the East Indies imported a total of 690 tons, during 1922 over 2,400 tons, and more than double this quantity during 1923.

Good Business for Coagulants

Important advance has also been shown by sales of alum to the extent of 50 per cent. during the past two years, so that the trade is larger now than before the war, and continues to find a steady demand for the purpose of softening and clarifying water for cattle. The latest statistics include a total of 67 tons direct from Great Britain, but 1,300 tons shipped from British possessions in Hong Kong and Singapore. This product was used formerly in rubber production in order to coagulate the latex from the rubber trees, but does not readily compete in price with acetic acid which is now the main coagulant. Large quantities of the latter commodity are now used, but the supply comes chiefly from Japan owing to the improvement in quality effected by this source of supply. Total imports are now annually about 600 tons, but of this amount the British quantity does not rise much above 3 per cent. From the current controversy raging round restriction of rubber output it is clear that the Dutch colonies are going ahead with rubber production, and that coagulant supplies will do better in those countries than in British Malaya.



BRITISH TRADE DEVELOPING IN CHINA.

Another localised industry arising out of the geographical positions of these areas, which has a very direct bearing upon chemical demands, is that of ice production. For freezing purposes ammonia sells well, but emphasis is laid upon the stipulation that it should be pure and dry. Smaller quantities of calcium chloride are also taken for the ice trade. A similar line of business is the manufacture of aerated waters, of which there is a large per capita consumption, and in this connection good quantities of citric acid and sodium bicarbonate are imported. Of this latter product total supplies amounting to 2,633 metric tons are mainly derived from British manufacturers, with about 30 per cent. of import trade being divided between the Netherlands and U.S.A.

The scope for expansion which is offered by growing industrialisation of production in the East Indies may be considered in relation to dyestuff imports which are used in the catik trade. German dyes have now re-established their former position, and most of the imports shown in statistics as direct shipments from Holland are regarded as being German in origin. These two sources furnished practically all the aniline dyes, but the total trade is, however, only about half its pre-war importance. Aniline dyes are now imported to the extent of 3,440 cwt. whilst the quantity for the year 1913 amounted to 6,654 cwt. Larger trade is effected with alizarine of which the latest year records 4,916 cwt. and with indigo dyes at 10,694 cwt.

Both in the Netherland Indies and in the adjoining colony of British Malaya steady demands are coming forward to British manufacturers for supplies of disinfectants and insecticides. The latter, for instance, takes 17,000 gallons per annum from the United Kingdom out of a total import approximating 19,000 gallons. Other products of British origin also do well in Malaya, notably carbonate and bicarbonate of soda, supplies of which from this country reach 8,000 cwt. at a value of £6,178 or approximately 90 per cent. of requirements, and that proportion represents fairly accur-

ately the demands which accrue to our productions, except in the case of sulphuric acid, most of which comes from Japan.

It must be realised that Java alone has a population of 40 million people, almost all of whom are engaged on plantations which are scientifically managed and offer a market for all that is first class in quality. On an even more extensive scale is the market in China, the chemical demand of which will in course of time correspond with its physical dimensions. At present, however, a difficult proposition confronts the British manufacturer by reason of the prestige in this country held by German exporters, and the up-country aniline dye trade is well maintained by these competitors. Moreover, they are conducting an intensive undercutting campaign, explicitly stating their willingness to sell at 10 per cent. cheaper than other suppliers, and reports concerning this activity are available from several quarters. Fair business is nevertheless being obtained by British manufacturers in the ports where textile factories are operated and importation of our synthetic indigo is on the increase. The dye position has undergone a slight change since the war when the monopoly was practically in the hands of Germany, with Switzerland a leading competitor, as an expanding interest in China's demand is being shown by Japan and U.S.A. and these countries are now supplying larger quantities. In other classes of chemicals Japan is increasing competition from the 1913 condition of affairs when 33 per cent. of imports were derived from this source, with about 20 per cent. each from Germany and the United Kingdom. The present analysis shows that Japan supplies about half the total trade. Industrial expansion, according to an interesting summary by the Hong Kong and Shanghai Chamber of Commerce, is offering a consistently widening field for chemicals which should be fostered carefully by British exporters. Certain industries, including tanning and glass-work, are entirely dependent upon imported heavy chemicals, and the development of textile production is giving growing demands for bleaching powder. China, of course, offers an immense field for fertilisers, and this is resolving itself into an effective import trade with the gradual removal of conservatism in the farming class.

Trading Methods Need Attention

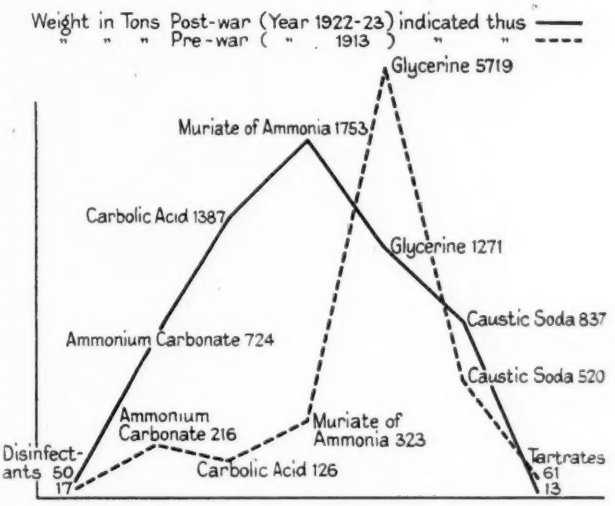
Speaking generally, the reports of British Trade Commissioners emphasise the difficulty which besets direct trading between manufacturer and Chinese merchant. It seems best to do business through a British merchant firm locally established, unless a selling organisation can be maintained in the country. Some companies selling kerosene and alkalis have been successful in this respect, whilst new buildings have been erected by two leading chemical firms in Shanghai to facilitate trade.

The chemical industry, however, in common with almost all branches of foreign trade with China, is suffering from the civil war conditions which, by their depressing influence upon trade as apart from physical interferences, are obstructing the natural growth of business.

The most important country in this area from the point of view of present chemical trade is Japan, which, although known amongstthe other Far Eastern countries as a prominent exporter, is also an importer of outstanding merit. In some varieties of chemicals this direction includes our best customers, and the market is exceedingly valuable in the share which is taken by British manufacturers. The world slump in business of a few years back is regarded as having shown its first symptoms in Japan, and certainly depression here was acute in both industrial and agricultural circles, but recovery is proceeding in a remarkable manner, and is exemplified by the excellent improvement shown by the fertiliser trade, which is now doing extraordinarily good business. During 1921–22 the British proportion of the sulphate of ammonia imports fell to quite a small ratio, and only totalled 1,255 tons, but increasing activity developed during the year 1923, so that more than 60,000 tons, worth nearly £1,000,000, were purchased from firms in the United Kingdom; and it is even more satisfactory to note that this expansion has been sustained by British manufacturers during the first six months of the present year.

As usual, the most important trade in heavy chemicals has been done in sodium carbonate and caustic soda, and business in these products has for the most part been met by Great Britain, although American exporters are putting up competition. Among the sodium compounds the imposing quantities of carbonates taken by the Japanese market represent 40 per cent. of our world exports, whilst more than 25 per cent. of our aggregate overseas trade in sodium compounds goes to this country, and our sales to Japan in this respect, during the year 1922–23, were valued at over £614,000.

Another class of chemical coming into greater demand is shellac, which is now being taken in considerable quantities to meet the increasing demands of the gramophone record industry and aeroplane construction. In regard to dyes, the prominent position held by German suppliers before the war is a great asset in their attempts to recapture the market, of


Weight in Tons Post-war (Year 1922-23) indicated thus ——
" " " Pre-war (" 1913) " " " ----
Glycerine 5719
Muriate of Ammonia 1753
Carbolic Acid 1387
Glycerine 1271
Caustic Soda 837
Ammonium Carbonate 724
Caustic Soda 520
Ammonium Carbonate 216
Muriate of Ammonia 323
Disinfect-ants 50 17
Carbolic Acid 126
Tartrates 61 13

COMPARISON OF BRITISH CHEMICALS IN THE JAPANESE MARKET.

which the annual import trade approaches £1,500,000. Examples of products in which British manufacturers show to best advantage include ammonium carbonate, of which nearly half our total export of 1,500 tons goes to Japan, and distilled glycerine, for which this country is our leading outside customer, constituting a valuable market of 25,000 tons. In many directions it is possible to visualise an increasing trade with this area, as the complete restoration is effected of industrial establishments damaged by the earthquake. Increasing imports of British chemicals have been recorded during the current year, and exports of potassium chromate and acetic acid are reputed to be doing good business. Textile factories are developing operations, and trade in bleaching chemicals is progressing.

As the comparative graph illustrates, Japan in its chemical trade with the United Kingdom occupies an exceptional position, inasmuch as the total trade is now in many products far greater than was the case in pre-war days. For 1913 the aggregate value of our exports in this direction was approximately 33 per cent. smaller than the recorded figure for the twelve months of 1922–23. During this last recorded year we have sent practically £1,000,000 worth of chemicals to this country, and the wide scope of trade shows in the inclusion on the one hand of sodium carbonate valued at £337,000, and on the other of such relatively small items as salicylic acid worth £253, and tartaric acid at £1,633. The latter values are, however, of sufficient importance to place this market as our second best customer in these lines, and, seeing the progress which is being made in other sections of the industry, the possibility of expansion in such products should not be neglected. Certainly in the case of tartaric acid the quantities of British supplies are not yet back to the pre-war totals.

On the whole, however, the position here may be summarised as being quite in consonance with other countries of the Far East, and that manufacturers who are developing their interests are being amply repaid.

How Acid is Packed for Shipment Abroad

A Review of Typical British Practice

The following notes deal with the subject of adequately protecting "dangerous" chemicals, particularly acids, for transport overseas, and outline the methods followed in typical English practice. The photographs have been specially taken by the courtesy of F. W. Berk and Co. at their works at Stratford, London, E.

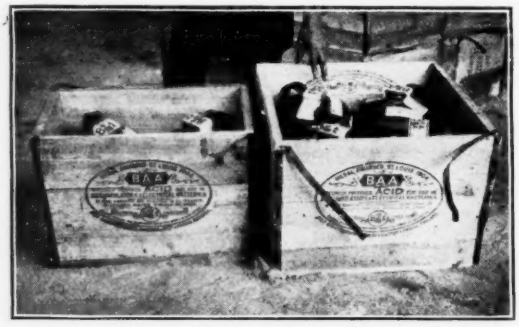
THE careful packing of goods for export is undoubtedly of the greatest value in developing overseas trade. A number of articles have appeared in various trade journals from time to time, suggesting that much of the goods exported from this country is ineffectively packed. This is undoubtedly true in some instances, but the general level of British export packing in the case of drugs and fine chemicals at least is undoubtedly high. This is shown incidentally by the remarks of an

A CORNER OF THE PACKING SHED, SHOWING STONE JARS

Argentine buyer quoted in our American contemporary, *Drug and Chemical Markets*, who states that fully 90 per cent. of the orders from the Argentine go to the European market because of the preference for the packing methods of the English, French or German exporters. Nevertheless, the illustrations reproduced in the periodical in question show that American exporters turn out packages of a very high order.

Essentials of a Good Package

The essentials of a good package are, of course, first and last, that the goods should arrive in the condition in which they were sent out. Secondly, in the case of acids and many



CASES OF 2 AND 4 STONE JARS OF ACID PARTLY PACKED, SHOWING SEALS AND LABELS ON THE JARS

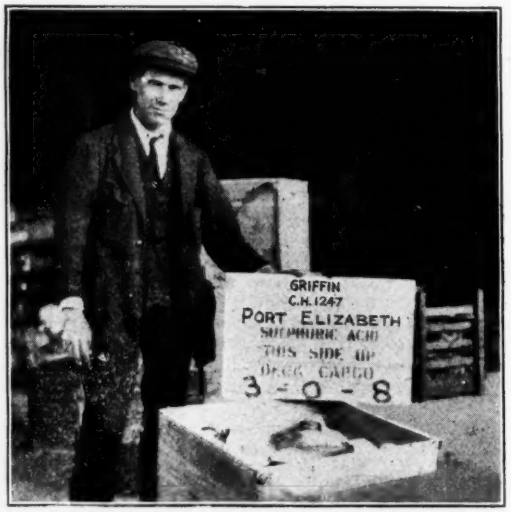
other chemicals it is of equal importance that in the event of accidental damage in handling, the contents of the package should be unable to injure anything outside, or heavy claims may be made by the shipowners or shippers. Another important consideration is that the possibility of pilferage should be reduced to a minimum.

General British shipping practice errs rather on the side of over-carefulness in regard to the carriage of acid, the regulation as to acid being carried on deck being at times a somewhat irksome restriction. It is now considered practicable for acids to be carried with safety in stout steel drums between decks separated by tiers of coal, but this has not been accepted to any extent by British shipowners as yet except for the less dangerous substances like carbolic acid.

Packing of Acids

Acid is usually exported in either the standard carboy, two-gallon stone jars or Winchester quart bottles. The question of packing therefore resolves itself into one of adequately protecting these somewhat fragile acid containers. Different buyers make different stipulations regarding details, and each manufacturer has his own variations, but the following description indicates typical British practice, as carried out by F. W. Berk and Co. at their works near Stratford, London.

Carboys are ordinarily protected by an iron frame, lined with straw, but for export purposes each carboy is enclosed in a wicker basket with a generous lining of wood shavings. The orifice is specially sealed, and a wicker cover is used over the basket to protect the whole.



MARKINGS ON A CASE OF SULPHURIC ACID FOR EXPORT

Perhaps the most popular method of exporting mineral acids is in two-gallon stone jars. These are of stout construction and are packed either singly, in twos, or in fours in stout wood packing cases. Wood dust mixed with a proportion of whitening is used as a packing material, well rammed down. All acids are treated similarly, but nitric acid has a larger proportion of whitening used in the filling material. The lid is tacked on and secured with metal bands running round the case. Rope handles are frequently used to facilitate handling. Winchester quart bottles are packed in a similar manner, except that somewhat lighter cases may be used.

The marking of cases is an important item in sending chemicals abroad. It is particularly important that the destination and other particulars should be clear and not liable to be confused by foreign labourers with any brand, trade-mark, or advertisement of the firm which may also be on the case. It is the practice with deck cargo to cut the name of the port of destination, the number of the consignment and other essential particulars in the wood with a hammer and chisel, so that there is no risk of these being obliterated by the action of heavy seas. The name of the commodity, the words "Deck Cargo" and "This Side Up," are stencilled, and in addition the weight of the package is painted on to complete it for dispatch.

Production Statistics of British Chemicals

The Value of the New Census

The Board of Trade is now engaged in preparation of schedules which contain information respecting production of British industries, and details concerning the data to be assembled are of interest.

FACTS which will serve to illustrate the national importance of the chemical industry are altogether of such an illusive nature that efforts undertaken with a view to presenting illuminating information are worthy of eager attention, although the co-operative nature of the work to be performed in connection with the forthcoming Census of Production necessarily involves assistance from business firms.

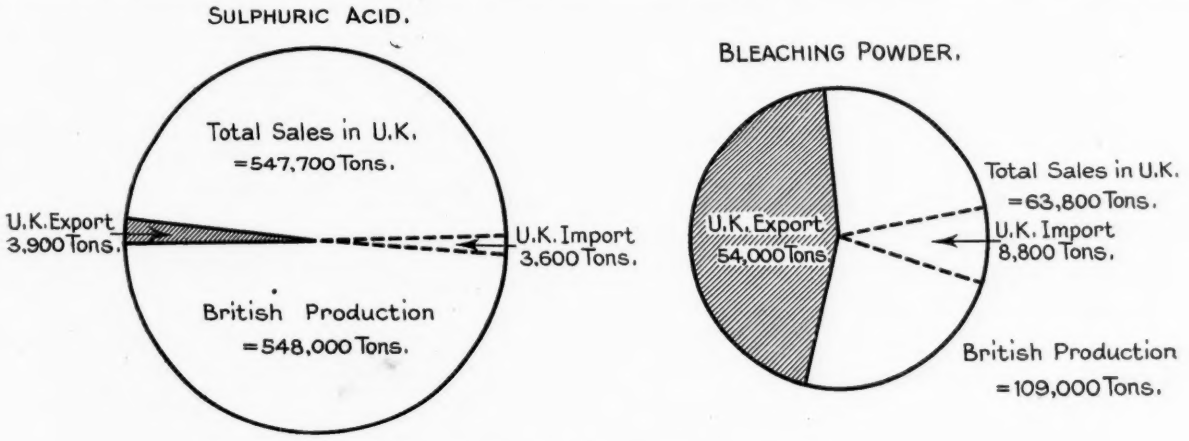
It may be accepted without question that the impersonal record now being directed by the Board of Trade will serve the best interests of our industry, but firms may expect some guidance as to the nature and reason for the census. Whilst Dominions and other countries are able to show returns annually—and indeed at more frequent intervals—which give the exact position of their industries in relation to production, this country has not been able to obtain such information for the past seventeen years. The Census of Production taken in the United Kingdom for the year 1907 is, in fact, the only exception to the statement that no comprehensive compilation has even been available to illustrate the position, as the basis of most manufactures, which the chemical industry maintains to-day. Even the 1907 return is now out of date, although it is all that we can refer to for statistical information as to what is the comparative importance of the chemical trade in respect of output or for the employment which it is able to offer.

Deficiencies in connection with our knowledge of the total dimensions of the home trade cannot be affected by research into the fairly accurate and up-to-date particulars we are offered for our foreign trade of imports and exports. We know what chemical products are sold to the peoples of other nations by British manufacturers and also what amounts customers in this country buy from other countries, but we do not know what seems to be very elemental, viz., what our own people buy from ourselves. Such a state of affairs is entirely inconsistent with a progressive development of the home market. An accurate census of British production will thus serve to dispel much guesswork, for only when we can take into account our production, imports, and exports, are we in a position to judge what is the actual home demand and the trend of its movement.

The past six months, for instance, have witnessed growing imports of chemicals into the United Kingdom accompanied by decreases in our export trade, which have occasioned much concern, but quite conceivably we are arguing for a wrong conclusion on the basis of half the evidence. It is possible that these signs portray an awakening trade activity, a continuance of which should be welcomed as evidence of a developing home demand. The fuller knowledge derived from a census will serve to put these matters in their true perspective.

More Stable Conditions Visible

Since the last Production Census, abnormal trade periods have been experienced, with the war-years till 1918, the boom of 1919-20, the rapid fall in prices of the subsequent year and what is generally accepted as a steady restoration since to normal conditions. These movements in the home demand are quite susceptible to statistical treatment, and the current year is, in the light of recent experience, peculiarly suitable for statistical attention, since prices are now showing appreciable stability. The officially compiled retail index, for instance, although calculated at present as 70 per cent. higher than pre-war values, represents the same level as shown by May, 1923, and is only 2 per cent. variation from the average of the past twelve months. As one reason of enormous commercial significance for obtaining such a census, the problem of tariffs, whether these are for the purpose of State revenue or for protection of the home manufacturer, may be considered in the light of known facts. The discussion of the fiscal question has been all along hampered and obscured by a plentiful lack of knowledge as to the dimensions of British production. The relation of imports to production is, of course, vital to the argument. Statements are frequently made, and doubtless often believed, that British industries are overwhelmed by dumped imports and consequently in need of succour. In the absence of modern official statistics for the total production, allegations may be made which cannot be disproved. The pros and cons of the Safeguarding of Industries Act furnish a case in point. Exceedingly valuable was the 1907 census in providing us for the first time with the means of measuring the output of material wealth, and in that connection interest attaches to the results shown at that date by chemical and allied trades.



STATISTICS AT LAST CENSUS OF PRODUCTION

Gross output from all branches of activity in the census year was computed at £50,666,000 of which 50 per cent. represented the value of coal tar products and pure chemicals. Fertilisers, sheep dips and disinfectants were valued at nearly £6,000,000, paints and colours at over £8,500,000, whilst soap and fats reached £12,218,000. This production was effected by a total of 97,259 persons engaged in the industries, using engines with an aggregate power of almost 165,000 h.p. An analysis of these factors shows that more than 53 per cent. of workers and 66 per cent. of machinery were contained in the group of pure chemicals and coal tar products, whilst output per head varied considerably amongst the different sections. Similar

results of £154 and £155 per head of workers during the year were reflected by the fertiliser and disinfectant trade and by soaps and fats respectively, but the chemical group showed a high average of £183, whilst output of paints and colours was even larger at £198.

Advantage of New Census

The new return now being obtained will be of paramount importance for comparative purposes in ascertaining how far the average worker's output has been maintained.

Another point of interest is the dissection of gross value of output, which for the chemical products at the last census was calculated at £24,025,000 gross. This included £9,000 expended in payment for work done by firms outside the trade, whilst cost of materials used in manufacture amounted to £14,500,000, so that taking in account some £25,000 of additional work performed by the trade, the net value of chemical manufacturing activity was reported at just over £9,500,000 during the year. For this group it is evident that of the selling value as represented by returns of gross output some 60 per cent. was absorbed by cost of raw material.

Since this compilation many changes have occurred in wages and hours of labour, so that it may be anticipated that the new return will show a decreasing ratio of expense for raw materials. The recorded proportion applies fairly well to other sides of the industry, since gross figures of fertilisers and disinfectants were divided into £3,941,000 as cost of materials used and £1,920,000 as net value of improvement derived from the work involved. For paints and colours the respective figures were £5,818,000 and £2,744,000, whilst for soaps and fats material costs were rather higher at 76 per cent., thus leaving a net productive activity for the year of £2,906,000.

Another result of census statistics was assistance in determining the extent to which the demand for British chemicals was met by British production and the relative value of the home trade as compared with the export. The examples of sulphuric acid and bleaching powder may be seen in the diagrams. Another line of development which is understood to have moved considerably since the war is in connection with manures. During the census year the total production in this respect reached 1,622,000 tons, with a value of £6,900,000, in which was included 241,000 tons of basic slag, 264,000 tons of sulphate of ammonia and 605,000 tons of superphosphates. The latest certain information which we have concerning this trade shows that during 1923 over 250,000 tons of ammonium sulphate and 12,214 tons of superphosphate were sent abroad, and these figures suggest changes. From statistics of the former commodity it might be assumed that home production has increased greatly, whilst for the latter commodity it is possible that an expanding home demand is being met. In either case this vagueness should be dispelled by the facts which the new census will offer us.

Progress of Nobel Industries

At the annual meeting of Nobel Industries, Ltd., on Friday, September 19, Sir Harry McGowan, K.B.E., the chairman, reviewed the progress in the various branches of the company's activities, which include explosive factories in Canada, South America, and South Africa, and works for fertilisers, insecticides, etc., in South Africa. The general financial position was satisfactory and it was suggested that an interim dividend might be declared shortly. The chairman also said that the holdings in British Celanese, Ltd., remained unaltered. Referring to the amalgamation of businesses, he said that some people held the opinion that a merging of similar interests destroyed initiative. It might be true in regard to some industries, but it had not proved to be so in theirs. A careful study of costs and efficiency results prevented slackening of effort, and when properly administered he felt sure mergers operated not merely to the advantage of the shareholders, but even more so to benefit the country at large. He felt convinced that the salvation of this country must lie in the direction of financial merging of those industries which had a surplus of productive capacity over consumption, as it was only by scientific concentration in the most efficient elements, and by making the most efficient and progressive the standard for all, that we could hope to withstand the serious competition which would ensue when continental countries recovered.

Study of Refractory Materials

Meeting of the Ceramic Society at Wembley.

A number of papers were presented at a meeting of the Refractory Materials Section of the Ceramic Society held on Thursday and Friday, September 18 and 19, at Wembley.

Mr. H. S. Houldsworth, of the Department of Gas and Fuel Industries at Leeds University, read a paper on "Some Properties of Clay—Sillimanite Mixtures." Test samples were fired under different conditions and their properties investigated. The results showed that under certain conditions sillimanite added valuable properties to the mixture. A pronounced increase in refractoriness was particularly noted as the sillimanite content increased. Mixtures containing about two-thirds sillimanite were more resistant to attack by basic slag and soda-lime glass than fireclay alone. In the discussion following the paper the long-lasting quality of clay-sillimanite furnace linings was emphasised by actual users.

Mr. W. Hugill and Mr. W. J. Rees made a contribution on "The Influence of Exposure on the Chemical and Physical Properties of Certain Fireclays." Manufacturers of refractory materials had a decided preference for fire-clay from the outcrop portion of the beds, where the clay had been under the influence of the weather. The authors had examined siliceous and aluminous clays, and came to the conclusion that in the case of the former only there was a distinct improvement in working properties resulting from exposure. Mr. W. J. Rees added that he thought that many aluminous clays would be shown to be improved by exposure when the authors had investigated further samples.

Mr. W. J. Rees then gave a paper on "Alumina-silica Minerals in Firebricks." Re-burning of firebricks appeared to lead to an increase in the mineral mullite, $3\,Al_2O_3\,2\,SiO_2$.

A paper entitled "X-Ray Investigations of Clays and Some Other Ceramic Substances" was read by Mr. Assaar Nadding (Sweden), who pointed out that X-ray methods provided a means for determining the mineralogical composition of clays for classification purposes. The mineralogical composition of clays was important, because the properties of the clays were so largely dependent on the nature of the minerals contained in them, but variations in this were not always shown by a difference in chemical composition. By means of X-radiograms a series of lines was produced, their grouping and strength being characteristic of particular minerals.

Storage of Silica Brick

Mr. W. J. Rees then contributed a note on "The Storage of Silica Refractories," in which he showed that weather had a markedly deleterious effect on the strength of silica bricks, although the chemical composition appeared to be unchanged.

Mr. W. Hugill and Mr. W. J. Rees also described a form of specific gravity bottle in which a given quantity of powdered brick was inserted, and by means of the rise in level of the liquid in the neck, the specific gravity was read off from the previously calibrated markings.

Mr. W. J. Rees then described experiments made on the connection between the true specific gravity (or powder density) and the after-expansion of certain bricks. There was found to be a sufficiently close relation for practical purposes in the case of bricks of fine or medium texture. It was also concluded that the grading of the raw material had a greater influence on the rate of quartz conversion than variations in the source or type of the raw material itself.

In the discussion on the last three papers it was questioned whether specific gravity gave a reliable indication of quartz conversion, but it was generally agreed that the exceptions were very few. In conclusion the chairman said that the Refractory Materials Section of the Ceramic Society might suggest to the Institution of Gas Engineers that they should be included when they were reconsidering the standard tests for silica bricks.

Recent Wills

Sir George Beilby, of Hampstead, London..... £163,689

George Clark, of Stocksfield, Northumberland, head of Mawson, Clark and Co., oil refiners and candle manufacturers £40,161

Chemical Possibilities in Canada

Scope for Chemists and Engineers

In the course of a public address at the Annual Convention of Canadian Chemists, held at Kingston, Ontario, on May 28, Mr. H. Freeman, F.C.I.C., research chemist, Shawinigan Falls, Quebec, dealt with the application of chemistry to Canadian industry and the possibilities of the chemist in that country.

Industrially Canada is much younger than the United States, and so the student in chemistry and applied science is confused about his future. America looks a more promising field, because there chemistry has been longer applied, but actually opportunities are less than in Canada. In the United States several of the easily obtained natural resources, such as the base metal ores and pulp-wood, are rapidly diminishing. Canada, however, is not yet anywhere near the zenith of development and many valuable resources are waiting for the chemist to point the way to production, thus the opportunities for the chemist are more numerous. The most effective and profitable researches and developments of Canadian resources have been done by private enterprise and will continue to be.

Chemical Engineering Developments

Commencing with the Yukon, coming southwards and eastwards, every province has need of the chemist or, more particularly, the chemical engineer. All the placer gold of the Klondyke must pass through the hands of a chemist (assayer), who in the early days was employed by the banks to value the gold and silver contents of the bullion. Now the Yukon produces more silver (by lode mining) than gold, and it has in this ore a great metallurgical problem as it does not pay to bring ore out of the country of lesser value than $120.00 to the ton. The silver must and will be extracted on the spot, and the chemist must find how to do it under the particular conditions of that country. That ore is now all going to the United States.

In British Columbia, copper smelting is important, but much unsmelted ore and also the blister copper leaves for the United States, and American chemists and others do most of the work on it. That ore is destined to be reduced and refined in British Columbia, using cheap power, which is to be obtained there. Then Canada will not import manufactures of copper of greater annual value than that export of ore. To accomplish this end, improved methods will be required, and the research engineer must be called in so as to combat the cheap copper from South America, produced by highly skilled engineering methods. British Columbia has a large electro-metallurgical industry at Trail. A vast deposit of low-grade ore is concentrated by physical-chemical methods (the selective flotation process) and the contained lead and zinc are refined and recovered by the agency of the electric current. The electrolytic zinc process was first successfully operated by Siemens and Halske in Germany, more than twenty years ago. British Columbia has one of several plants using this process, which between them produce about one-tenth of the world's zinc.

In Alberta, the chemical engineer is required to solve the problem of extracting 15 per cent. of bitumen from millions of tons of tar sands, which are now available to the railroad at Fort MacMurray. Saskatchewan will some time have a considerable industry based on its sodium sulphate deposits. Canada imports over $1,000,000 worth of sodium sulphate annually, chiefly for its paper manufactures. There are many millions of tons of sodium sulphate, and more millions of tons of lignite coal in Saskatchewan. There is plenty of work for the pioneer chemist-engineer. Manitoba has ore—millions of tons containing zinc, copper, lead, and iron, and it has cheap power. It needs research on concentrating and electrolytic or electro-thermal reduction processes, but there is no doubt as to the future of electro-metallurgy in Manitoba.

Ontario's Great Chemical Industries

Ontario is world famous for its Niagara power. There operates one of the world's largest nitrogen fixation plants, almost unknown to the Canadian public. In its operation, a hundred tons of Canadian air is liquefied daily, its nitrogen extracted and converted, through the agency of electricity, into fertiliser for other parts of the world, and into many other useful compounds. Not the least of these nitrogen derivatives is cyanide. Canadian cyanide manufacture was not considered at all feasible ten years ago; now Canada produces the major portion of the world's cyanide, and by it nitrogen from our atmosphere performs the useful function of extracting gold and silver all over the world, and it also serves to fumigate the orange trees of California on a big scale.

There is a works at Niagara, Ontario, producing artificial graphite by the intensity of electric heat; another producing carborundum by heating sand and coal electrically; another making aloxite by fusing bauxite ore brought from the Southern States. Niagara power is transmitted to Windsor, Ontario; and is used there to decompose salt brine from the wells. The initial products are chlorine and caustic soda, the former being used on a vast scale for the purification of water, bleaching pulp, paper and textiles, and the latter for making soap and for many other uses. Cheap Niagara power provides for a group of factories in Welland making alloys by electro-thermal processes and the carbon electrodes used in electric furnaces. In the Niagara Peninsula a group of important pulp plants operate on Niagara power and use chemicals produced by its aid.

Electro-Chemical Processes

In Quebec, in the St. Maurice valley, is over 400,000 developed horse-power. Some of this is used for fusing coke and lime to make carbide. This carbide is a starting point for many valuable chemical products. The first product is acetylene gas. From this is manufactured aldehyde and from aldehyde is obtained acetic acid. Acetic acid made at Shawinigan from calcium carbide is in the world market. It is used for dissolving cellulose in England, for coagulating rubber in the tropics, and as vinegar. This vinegar, prepared from coke and lime and air by purely chemical processes, is purer than ferment vinegar. At Shawinigan also is a carborundum operation on a large scale, and an aluminium metal production, both being operated on imported raw materials and owing their existence to cheap electricity. A new application of the electric furnaces in the manufacture of sodium sulphide, hitherto not produced in Canada, and also, for certain reasons, considered impossible of manufacture in the electric furnace, is now worked. This process is a direct result of a research partly financed by the Canadian Research Council and carried out at Vancouver, B.C., for an entirely different object. The sulphide is used for the recovery of silver from solution at Cobalt, for making and dissolving the dyes used in printed cotton goods, for dehairing hides by tanners and wool-pullers, and in the separation of zinc and iron from lead in the flotation of complex sulphide ores.

This incomplete list is enough to show that the trend of chemical industry in Canada is toward the use of cheap electricity and electro-chemical processes, and this alone among Canada's natural resources is permanent, and by its aid the country is to-day manufacturing chemical products which are competing in cheap foreign markets. The best field for the chemist to-day is in some branch of the electro-chemical industry, where there is ample opportunity for the pioneer.

Egyptian Government Regulations

In a special article on the Egyptian outlook, *The Board of Trade Journal* states that one of the principal features of the petroleum policy of the Egyptian Government in 1923 was its attempt to impose on the petroleum trade and industry of Egypt regulations for storage of so drastic a nature that their application in their original form would certainly have curtailed, and might in some cases have terminated, the activities and enterprise of the private companies concerned.

The exemption of chemical manures from import duty has so far been renewed each financial year by the Council of Ministers. At present they have not come to any decision thereon, and as from April 1, 1924, the beginning of the current financial year, the Customs Administration have been collecting duty provisionally at the normal rate of 8½ per cent. *ad valorem*.

The specific duties on imported alcohol were again modified by a decree, dated May 12, 1924, which, while simplifying previous regulations, has on the whole increased these duties. Excise duties on locally distilled alcohol have undergone no change, but it would appear from the decline in revenue—viz., from £E.276,708 in 1922–23 to £E.210,953 in 1923–24—which is largely accounted for by decreased local production, that the Excise duties on alcohol are too high.

Fire-Fighting Equipment for Chemical Works

By Hartland Seymour

In the following article the author gives a comprehensive review of the steps which may be taken to control and extinguish fires in manufacturing plant, particularly urging the necessity of attacking the fire at the outset.

"A LITTLE fire is quickly trodden out; which, being suffered, rivers cannot quench." So said, I believe, Shakespeare. Interpreted in the light of modern practice in chemical works, what it means is that all fires are small at first, and that the only way to prevent a small outbreak from developing into a disaster is to be prepared to extinguish the fire at its beginning, *i.e.*, by having about the plant devices and appliances which are capable of combating every kind of fire which is likely to occur in chemical works, for in no other industry are the consequences likely to be so disastrous. Besides the actual intrinsic value of fire-fighting equipment, there is a definite plan of action for those on the spot, thus helping to prevent panic and minimising the destruction of life and property.

The adoption of private fire protection does not necessarily involve expensive equipment, and in most cases where industrial premises are concerned a first-aid fire protection installation will secure rebates off insurance premiums. No concern can afford to have business stopped by a fire, and the heavy losses which have occurred in various trades have caused fire insurance companies seriously to advance their premiums on these classes of risks, thus causing heavy increases in annual working expenses to the firms concerned. To counterbalance this, most of the fire offices are willing to grant substantial reductions (ranging from 5 to 25 per cent.) on their premiums for the insurance of buildings fitted with adequate fire-extinguishing appliances. Thus, where ordinary rates are high, the firm providing fire apparatus may find that the saving in insurance will in a few years pay for the appliances, and afterwards they may actually reap a handsome profit on their investment.

The London Building Acts (Amendment) Act, 1905, the Factory and Workshops Act, 1901, and the by-laws of the London and other County Councils all affect the question of means of escape from factories and workshops and other business premises, and many of the larger fire-appliance manufacturers have had special experience in carrying out work to meet the regulations of the authorities in this respect, and also carrying out other fire protective work to secure reductions in insurance premiums from the fire insurance offices.

Extinguishing Fires with Water

The oldest and still most general system of extinguishing a fire is what professional firemen call the "cooling down process." The object of this is to reduce the temperature of the fire to below the point of ignition, and this is usually accomplished by means of water. In the case of large factory premises motor fire engines are now frequently adopted. A typical design of such a machine is the Merryweather "Hatfield." This engine has a pumping capacity of 350 gallons per minute, but various sizes are made ranging from 200 to 600 gallons capacity per minute.

For buildings provided with water at high pressure (say, 700 lb), for working hydraulic lifts, cranes, etc., Merryweather's have devised a new pattern hydrant which can be fixed direct on to the 700 lb. hydraulic main. This main can be as small as ¾-in. diameter, and the valve is specially constructed so that the pressure in the hose is reduced to anything that is required, say, 100 lb. Often these small pipes can be fixed in positions where it would be impossible to instal 3-in. or 4-in. low pressure pipes. Hydrants and hoses should be located at danger spots so that fires occurring amongst wood, shavings, straw, or paper and similar easily combustible materials can be quickly subdued. There are boards available which hold any length of hose, a hand pipe and a hatchet. This apparatus, if fixed on the wall near a hydrant, can very quickly be brought into operation.

Chemical Appliances

The second class of fire-fighting equipment is the chemical appliance. The first object of chemical fire apparatus is to provide a supply of water at a sufficiently high pressure for instant use in the event of fire. The means adopted for generating such pressure also allow of the water being charged with a heavy inert gas, which greatly increases the efficiency of the apparatus. Chemical fire apparatus depends for its efficient action on the property of carbonic acid gas to dissolve in water. When CO_2 is produced in a closed vessel full of water, sufficient pressure is set up to enable the gas-charged water to be forced through a hose pipe and nozzle, and thrown to a considerable diatance with great impact force. The water being projected on to a fire releases the gas, which, being much heavier than air, lies like a blanket over the burning material, prevents the access of oxygen from the surrounding atmosphere, and thus quickly and effectually subdues the flames.

A large number of hand extinguishers operate on this principle. For instance, the Pyrene extinguisher is filled with a special fluid known as Pyrene liquid. Immediately Pyrene liquid comes into contact with a fire at 200° F. or over, it forms a heavy, dry, cohering non-poisonous vapour "blanket" which separates the flames from the burning material, cutting off the air supply necessary for the life of a fire. Pyrene liquid is a combination of purely organic substances, and is free from either acids, alkalis, salts or moisture. Its use avoids the damage generally resultant upon the use of water or certain other types of chemical fire extinguishers.

A Semi-Automatic Device

Another similar hand extinguisher is the Conquest. The operation of this fire extinguisher is simplicity itself. By turning the machine upside down a powerful jet of fire-extinguishing fluid is immediately projected, and this can be directed and forced into the heart of the fire from any angle by means of the stout rubber hose. This is an advantage over machines of this type that are not fitted with hose. The Conquest has no valves or taps to adjust, no plunger or intricate mechanism to get out of order and is in every way a most reliable machine. It is tested to a pressure of 350 lb. to the square inch. This extinguisher has been carefully designed and balanced so that it can be carried conveniently to the seat of the fire by means of the brass wheel at the top.

The Konus Kemik hand extinguisher depends for its efficient action on the generation of carbonic acid gas by the combination of bicarbonate of soda and sulphuric acid. When this gas is formed in a closed vessel full of water, it is projected through a nozzle to a considerable distance.

Works fire engines operating on the same principle are also available. For instance, the Pyrene chemical fire engine is operated by the action of sulphuric acid upon a bicarbonate of soda solution, and is particularly suitable for the protection of warehouses and factories. These engines stand in readiness in an upright position. To bring them into action it is only necessary to pull down the handles and rest them on the floor. They are designed to give long and satisfactory service and need very little attention. They are tested to 350 lb. pressure to the square inch. One of these engines, with a capacity of 17 gallons will throw its liquid 50 feet.

Chemical Fires

In chemical works other types of fire of an extra hazardous nature have to be encountered. This is owing to various factors, the most prominent being the enormous increase in the oil business, supplemented by the impetus given to the production of dyes, chemicals and other derivatives of coal-tar by the war and the installation of by-product coke ovens, which has made benzol available. The need for better fire protection has also been emphasised by the increased production and use of inflammable liquids such as ether, alcohol, bisulphide of carbon and many others not essentially related to coal-tar products. Manufacturers of paints, oils, varnishes, linoleums, etc., have also felt the need of special protection, and particularly in those factories using dip tanks for lacquering and varnishing.

The proper solving of this problem has been difficult owing to the nature of burning liquids. These are all lighter than water, and in most cases the attempt to use water on such fires is worse than useless, as they float on the water and continue to burn, the water merely serving to carry the burning liquids all over the property and spread the fire. In such fires the main use of water is to cool the surrounding property while the burning liquid is allowed to burn itself out.

Ordinary Extinguishers Inadequate

The ordinary chemical extinguishers are equally inadequate, for they usually deliver water charged with carbonic acid gas. This gas is carried away by the fire-draught while the water spreads the fire. The chemical used may be carbon tetrachloride, alone or mixed with other ingredients to lower its freezing point, which extinguishes a fire by forming a mass of vapour which will not support combustion. These vapours, like the gases mentioned above, are apt to be carried off by the wind or the draught created by the fire.

There are but two ways of putting out fire, one being to cool the burning material below the point where it will combine with oxygen, and the other being to exclude the oxygen of the air, for all such fires as are now being considered require the chemical combination of the burning matter with oxygen. Many variations of the latter principle have been tried.

The Use of Steam

The most general application of this method for oil tanks is the use of steam, it being the common practice in refineries to have steam pipes leading from the boiler plant to each tank, and connected into the latter at the side, just below the top angle, with "goose necks" to prevent the oil flowing back into the steam lines. Other applications of the same principle may be cited, such as the smothering of fires in the holds of ships by means of steam, sulphur fumes, or by means of carbon dioxide fumes.

These applications either of steam or chemical gases are only efficient when gases can be confined. They cannot be used in the open, as the draught created by the fire carries them away before they can be effective. This method is therefore of very limited application and of little or no efficacy except on fires in sealed enclosures. In the case of steam applied to oil tanks, the same holds true. If the roof remains on the tank, steam may put out a tank fire; but, unfortunately, the roofs are usually blown off by the explosion of the gases between the surface of the oil and the roof, which almost invariably precedes the actual ignition of the oil itself. When this occurs the steam is simply carried away by the fire draught with the flames and smoke.

The Use of Foams

It was early recognised that, while the use of smothering gas was the proper way to extinguish such fires, and that the gas used should preferably be one which is heavy and will itself inhibit combustion, the great difficulty was to apply gas in such a manner as to retain it on the fire. Carbonic acid gas appeared the most suitable gas to use, because it is a non-supporter of combustion, is heavier than air, and easily produced by the reaction between simple chemicals, yet it was difficult to decide what chemicals would produce the most efficient foam.

Naturally, various acids were first used for the acid solution, but it was found that while foam was produced, it had but little persistence, and soon disappeared. By a process of elimination, it was determined that acid should not be used, but, instead, a solution of an acid reagent which not only liberated carbonic acid gas when mingled with the basic solution, but also helped to improve the quality of the foam by materially strengthening it.

Stabilising the Foam

The most difficult matter was to find a suitable foaming medium, and it was from this side of the question that the Foamite Firefoam Company first approached the subject. The first requisite of the foaming medium isthat it sh all produce a good, stiff, durable, fire-extinguishing foam, and the second that the foaming medium shall not decay, decompose or deteriorate with age.

There are a certain number of materials which have been tried, but practically all of them are of organic origin and ferment or form moulds, and thus soon lose their foaming properties. Many means of preventing this have been tried, such as the use of preservatives, including arsenious oxide, formaldehyde, carbolic acid, salicylic acid, etc., but with no success. The surface of the solution has been covered with a layer of oil to exclude the air, but even this has proved unavailing. The foaming agent itself must not be subject to deterioration. A number of these unreliable foam-forming chemicals are on the market, and should be carefully avoided.

"Foamite"

After much laboratory research and experiment, a satisfactory substance was produced and given the trade name "Foamite." Foamite is a black liquid about the consistency of molasses, and is ordinarily contained either in steel drums of fifty gallons capacity, or wooden barrels, although steel drums are preferable. Owing to its being in liquid form, it can be dissolved readily. Foamite is alkaline in its reaction, and lasts indefinitely, either in its original form or when dissolved, without deterioration.

One problem was to devise some form of discharging apparatus of a semi-automatic nature which would be applied to groups of tanks where individual control was difficult. With this end in view, the Foamite Firefoam semi-automatic head was produced, operating on the principle of a double automatic sprinkler head. These heads may be applied to a group of tanks all connected to one set of solution lines, and in case of fire the Firefoam will enter only the tank on fire or any other one of the group which becomes hot enough to fuse the link.

Methods of Application

As the foam must be produced where it is to be used, and as ordinary hose, except in very short lengths, cannot be used owing to the friction and pressure breaking down the bubbles, it was found necessary to use separate hose lines with a special breechings piece, nozzle and mixing tube, in which the two solutions mix. This arrangement permits Firefoam being played like a stream of water on any burning surface, and greatly increases the efficiency of the installation. The invention of a special Foamite Firefoam automatic sprinkler head followed, by means of which the advantages of this system may be applied to buildings where extra hazardous trades are conducted or which may be filled with materials upon which water could not be used.

The Use of "Phomene"

Another extinguishing foam which is very effective in putting out similar fires is Phomene. Phomene foam also puts out fires by applying a foam blanket to the burning surface. The foam expands as it is applied, and quickly spreads over the surface in all directions. It cuts off the oxygen necessary to combustion, and thereby extinguishes the fire. The foam blanket itself is impervious to fire, and it forms a perfect protective covering, blotting out the fire within and prevents ignition from without. The foam is non-injurious to materials. After putting out the fire it can be removed while still moist, or allowed to dry off. Phomene foam should be skimmed off the surface of liquids as soon as convenient. It can easily be wiped off solid surfaces, or brushed off soft goods. In all Phomene machines the foam is produced and pressure generated for expelling it by the automatic mixing of solutions. As the foam is formed it expands eight times. A two-gallon hand extinguisher produces 16 gallons of foam, and a 34-gallon Phomene engine produces, 272 gallons of foam.

Some Other Inventions

An artificial extinguisher which puts out fires upon which the ordinary chemical extinguisher has no effect is Fire Snow. This is an artificial snow charged with carbonic acid gas. Two harmless dry powders, dissolved in water, make the two charging solutions.

Fire Suds is another invention for extinguishing fires of oil, petrol or any burning substance which, being lighter than water, floats thereon and is unharmed thereby. Fire Suds, as its name implies, is a semi-fluid substance of a tenacious character, containing in its mass large quantities of an inert gas.

The above named are but a few of the modern appliances, but the brief account of their efficacy goes to show that there is an appliance to meet every contingency.

Canadian Chemical Trade in 1923

An Increase in Both Production and Imports

Mr. S. J. Cook, chief of the Mining, Metallurgical and Chemical Branch of the Dominion Bureau of Statistics at Ottawa, recently contributed a review of the progress made in Canadian chemical industry during 1923 to our contemporary "Canadian Chemistry and Metallurgy." It will be noted that imports have shown an increasing tendency, and although Great Britain is only the second importing country, the greater proportion of the increase recorded in 1923 is derived from British sources.

INCREASED values marked the records of the production, imports and exports statistics relating to chemicals and allied products in Canada in 1923. A preliminary survey of the output of chemicals and allied products from Canadian plants shows a valuation of $106,544,000 as compared with $95,944,000 in 1922, and $87,185,000 in 1921. Exports of Canadian products in this class during the calendar year were valued at $15,768,412 as compared with $12,484,006 in 1922 and $10,327,538 in the preceding year. Imports showed less change at a total of $26,170,537 as compared with $25,689,052 in the previous twelve months and $25,014,118 in 1921.

Of the 1923 exports classified as chemicals and allied products nearly 82 per cent. went to Canada's best chemical customers, the United States, United Kingdom and Mexico, in the order named, and nearly 13 per cent. was shipped to six other countries which, arranged in order of the value of their imports from Canada, were Newfoundland, Japan, British West Indies, Australia, Cuba and New Zealand. On a smaller scale, export shipments of chemical products were also made to about fifty other countries.

On the other side more than 98 per cent. of Canada's import business in chemical products was from seven countries, with the United States leading and Great Britain next. The remaining five countries arranged in order of importance as sources of Canada's supply were, Germany, France, the Netherlands, Belgium and Switzerland. The remaining 2 per cent. of Canada's chemical import trade was drawn from more than a score of different countries.

The Trend of Prices

The index number of wholesale prices, compiled by the Dominion Bureau of Statistics and weighted according to the importance of fourteen principal chemical products, showed, on a base of 100 for the average price in 1913, a steady advance to a peak of 223·3 in 1920, since which year there has been a gradual recession to an average of 164·8 for 1923.

The trend of chemical prices, which during 1922 had declined about 2·5 per cent., dropped off nearly 3 per cent. further during 1923 to the lowest point for the year in December. This fact, taken in conjunction with the production values reported, confirms the impression that the volume of production during 1923 was even greater than the difference in values given would indicate.

Production records in almost every industrial field during the three years after the war showed the effect of post-war influences. In 1919, as a result of the large scale production which had been built up, the accumulation of stocks was considerably in excess of current requirements, and production was much curtalied. Most of these stocks were disposed of in 1919, with the result that in the early part of 1920 an appreciable advance in prices occurred, reaching a maximum about the middle of the year. This advance in prices was followed by increased production, and in many industries 1920 was a banner year. During the closing months, however, demands from consumers for lower prices became more insistent, and in 1921 a nation-wide reduction of inventories and deflation in prices occurred. At the close of that year, although prices were at a much lower level than at the beginning, conditions throughout the industry were much improved and the prospects for conservative and consistent progress were much better than at any time since the close of the war. Substantial progress was made in 1922, and 1923 opened with conditions distinctly favourable for a marked advance in production; these conditions prevailed throughout the year.

Production of Chemicals

In studying the production of chemicals and allied products in Canada it has been found convenient to arrange these industries in ten groups—namely, coal tar and its products; acids, alkalis, salts and compressed gases; explosives, ammunition, fireworks and matches; fertilisers; medicinal and pharmaceutical preparations; pigments, paints and varnishes; soaps, perfumery, cosmetics and other toilet preparations; inks, dyes and colour compounds; wood distillates and extracts; miscellaneous chemical industries.

The most outstanding advance for the year was reported by the group producing acids, alkalis, salts and compressed gases, which had an output valuation of $22,962,000 as compared with $16,879,000 in the preceding year.

Next in importance was the paints, pigments and varnishes group, which contributed products valued at $20,750,000, an advance of more than half a million dollars over the £20,231,000 given for 1922, when this industry held first place among the producers of chemicals and allied products.

The production of soaps, washing compounds and toilet preparations commanded third place with a total output of $17,212,000 as against $15,842,000 in 1922.

The fourth place was again held by manufacturers of explosives, ammunitions, fireworks and matches, whose combined outputs were valued at $15,231,000 as compared with $13,789,000 in the preceding year.

Miscellaneous chemical industries came next with a total output valuation of $10,482,000. In the preceding year this group reported production values amounting to $10,145,000.

The manufacture of medicinal and pharmaceutical preparations showed considerable improvement over the production of the previous year, the output being valued at $12,460,000 as compared with $11,533,000 in the previous year.

Colour Industry Firmly Established

Inks, dyes and colours, now a firmly established industry in Canada, producing printing inks, writing inks and various prepared dyes and colours, sold $2,895,000 worth of products during the year, marking a slight advance over the outputs of the two preceding years, but not quite coming up to the record established in 1920.

Complete statistics regarding the output of wood distillation products in 1923 were not available at the time of writing, but the reports in hand indicated that the output during the year was slightly above that recorded in 1921; the total value will probably be about $2,100,000 as compared with $1,902,000 in 1922.

A still further decline production must be recorded for the fertiliser industry in 1923, the output being valued at $1,584,000 as compared with $1,981,000 in the preceding year; $2,678,000 in 1921 and $3,788,000 in 1920. These figures include only the production of those plants whose major products were fertilisers. There is, of course, in addition to the output of these works, a substantial contribution made to the trade by the slaughtering and meat-packing establishments and such industries as those engaged in the coking of coal with the recovery of ammonium sulphate as a by-product. For statistical purposes, the manufacture of cyanamide is included in the group "acids, alkalis, salts and compressed gases" or what might be termed the "industrial chemical" group.

Finally, there is the coal-tar distillation industry, whose products reach an annual value close to a million dollars.

Ten Per Cent. Increase

Summing up production, it will be observed that the output from plants producing chemicals and allied products in Canada in 1923 was more than 10 per cent. higher than in the previous year.

More than $124,000,000 capital was employed in Canadian plants manufacturing chemicals and allied products last year. This figure includes the cost of lands, buildings, and equipment, the value of raw materials and finished products on hand at the end of the year, and the working capital including cash and

bills receivable as reported by the concerns whose plants were operated at any time during the year. While the number of plants in operation remained practically unchanged from the previous year, the amount of capital employed showed an increase of about six million dollars.

Employment was furnished to nearly 14,700 persons during the year, and the total salaries and wages paid amounted in all to $17,847,000.

Materials used in manufacturing were valued at $52,966,000 and from these materials, products aggregating in value $106,544,000 were made, so that the difference $53,578,000 represented the created values attributed to the industry as a whole, or in other words, this sum represented the value added by the manufacturing process, and out of this sum payments were made of salaries and wages, cost of fuel and power, and other miscellaneous manufacturing and operating expenses; the residue represented the return on capital invested.

Sufficient information was not available at the time of writing to permit of a complete analysis of these several factors, but the total selling value of all chemicals and allied products made in Canada in 1922 was approximately 95·94 million dollars; the total expenditures including wages and salaries, miscellaneous expenses, cost of fuel and raw materials amounted to 83·79 million dollars, leaving a gross profit of about 12·15 million dollars as earnings on the capital investment of $118,025,483, or slightly more than 10·3 per cent. as compared with approximately 8·4 per cent. in 1921.

Imports of Chemicals

The production of chemicals and allied products in Canada covers a wide range of commodities, some of which are produced on a very large scale, others to a more limited extent. The needs of a country having a population of nearly nine million persons scattered over an area of three thousand miles in length by a few hundred miles in width are distinctly different from those of many other countries where the distribution of its population is less extensive. As a consequence, Canada's imports of chemical products are perhaps greater than might be expected, while on the other hand production and the development of an export trade have so far been limited to the more populous provinces. Canada's middle west, rich in mineral resources, has not yet become an important factor in the chemical production of the country and its export trade in these commodities is negligible. Quebec and Ontario are the principal chemical-exporting provinces.

Production Dependent on Electrical Power

In the production of those chemical commodities which bulk largest in Canada's export chemical trade, the plentiful supply of cheap electrical energy developed in recent years has played an important part. Sodium cyanide, cyanamide, and calcium carbide are the three largest items in the group and the exportation of acetic acid, much of which is produced from carbide, has also increased in recent years. Canada's other chemical exports of importance include soda ash, cobalt oxides and salts, ammonium sulphate, paints, pigments and varnishes, medicinal and pharmaceutical preparations, soaps (more particularly toilet soaps), and white arsenic.

In the fiscal year ending March, 1891, exports of chemicals and allied products were valued at $851,211. During the next ten years there was little change, but a slight improvement to a total of $1,001,544 occurred in the year ending March, 1902. From that time on Canada's exports of chemicals and allied products increased in value until during the years of the war the peak of $57,406,349 was reached.

The decline which set in during the fiscal year ending March, 1920, reached its low point of $9,506,170 in the twelve months ending March, 1922, and the following fiscal year showed an upward turn to a total of $14,046,940 for Canada's exports of chemicals and allied products. Subsequent statistics continue to show improvement, and with industrial conditions more favourable on every hand, the development of further export trade may be expected.

As supplementing the foregoing review a table is appended showing the value of chemical products by classes imported into Canada during the past three years. There is a recapitulation of these data showing the imports from the United Kingdom, the United States and other countries separately.

IMPORTS INTO CANADA OF CHEMICALS AND ALLIED PRODUCTS.

Commodity	1921 $	1922 $	1923 $
Acids	451,396	552,071	506,177
Alcohols, Industrial	1,415,341	91,891	13,947
Cellulose Products	957,159	956,184	1,081,715
Drugs, Medicinal and Pharmaceutical Preparations	2,492,690	2,366,788	2,639,574
Dyeing and Tanning Materials	3,757,650	4,055,951	4,079,040
Explosives	267,911	463,501	771,111
Fertilisers	2,589,190	2,047,451	1,673,841
Paints, Pigments and Varnishes	2,599,351	3,439,841	3,615,777
Perfumery, Cosmetics and Toilet Preparations	943,863	902,917	872,401
Soap	1,229,726	1,139,870	1,389,324
Inorganic Chemicals	4,946,076	6,220,035	5,819,887
All other Drugs and Chemicals, etc., n.o.p.	3,363,980	3,452,552	3,707,763
RECAPITULATION—Canada's Foreign Trade in Chemicals and Allied Products with:			
United Kingdom	3,095,005	3,765,429	4,090,538
United States	18,409,640	18,229,688	18,740,901
Other Countries	3,509,473	3,693,935	3,339,118
Total	25,014,118	25,689,052	26,170,557

Production of Asbestos in Canada, 1923

THE Dominion Bureau of Statistics has just issued the following finally revised statistics on the production of asbestos in Canada during 1923.

From the point of volume of sales, 1923 may be considered the premier year for the asbestos industry in Canada, but the total sales value of this commodity declined very materially. The sales for the year totalled 231,482 tons with a return to the operators of $7,522,506, as compared with 163,706 tons sold in 1922 worth $5,552,723.

The total quantity of asbestos rock mined during the year amounted to 3,768,542 tons, of which 3,217,580 tons or 85 per cent. was milled. The mill recovery of marketable asbestos was 7·3 per cent. or 237,000 tons.

A small test shipment of crude No. 1 and 2 was made from a newly-developed deposit of asbestos, near McKay Lake, Deloro Township, Ontario. In Quebec, experimental operations were carried on by one firm to recover the fibre from asbestos rock by the wet process.

The following figures show the output and shipments of asbestos in Canada in 1923:—

Classification.	Total Output	Quantity (Tons).	Total Sales Value at Mill.	Average Value per Ton.
Crude No. 1	1,029	603	$275,101	$456.22
Crude No. 2	3,066	3,246	$794,834	$244.86
Fiberized crude	220	5	$1,306	$261.20
Spinning stocks	10,439	11,708	$1,456,904	$124.44
Shingle stocks	28,861	25,533	$1,215,892	47.62
Millboard stocks	6,549	7,268	$189,200	$26.03
Paper stocks	62,702	69,743	$2,292,804	$32.87
Paper fillers	67,791	62,689	980,964	$15.65
By-products (asbestos, sand, finish, floats)	56,002	50,687	$315,501	$6.22
Total	236,659	231,482	$7,522,306	$32.50

Nitrite Tariff Case

ACCORDING to *Drug and Chemical Markets* the constitutionality of the flexible provisions of the Tariff Act is questioned by the Norwegian Nitrogen Products Co., New York, which is seeking to reopen the investigation of duty on sodium nitrite. The District Supreme Court has refused to order the Tariff Commission to open for inspection the records in connection with the investigation of the duty on sodium nitrite, which resulted in an advance of 50 per cent. by presidential proclamation following the recommendation of the commission. The increase in duty was opposed by the Norwegian company. The commission refused to permit inspection of its data on the cost of production of nitrite of soda on the ground that the information was confidential. The brief contends that the question of the constitutionality of the flexible provisions of the tariff law is an issue and that the lower court erred in refusing to consider it.

French Chemical Industry Notes

[From Our Paris Correspondent.]

German Dyes In France

The "Union Syndical des Fabricants de Matières Colorantes" fears that if Germany succeeds in eluding the dye regulations imposed by the Treaty of Versailles and is allowed to sell freely in France the products that the latter is not yet in a position to manufacture, the success of the new French dye industry will be seriously threatened. M. de Kap-Heer, the general secretary of the manufacturers' union, has informed M. G. Kimpflin that the present French production in intermediates corresponds to 95 per cent. of the consumption; the balance of 5 per cent. represents about 1,000 out of 3,000 known dyes, the demand for each of which is too small to warrant their manufacture in France at present. Under the ordinary regime this 5 per cent. is supplied by Germany to an official organisation which distributes it according to requirements. With a free hand the German might succeed in imposing the acceptance of all his colour goods, at reduced prices, to consumers obliged to buy from him the relatively few colours not yet produced in France. Any defensive French effort to meet this would be counter-acted by a further reduction of German prices until Germany would finally dominate the market, while simultaneously destroying, by virtue of this fact, protection raised in France during the last five years.

This attitude explains the insistence of the French in the matter of dye supplies from Germany—an attitude which at first sight appeared to be inconsistent wth a prosperous and developing home industry which, according to M. de Kap-Heer, has increased its average monthly production from 50 tons in 1919 to 1,200 tons in 1923.

The Phenol Industry

The desirability of maintaining the phenol industry, which was practically created by the War, is demonstrated by M. G. Kimpflin in an interesting communication to the *Journée Industrielle*. M. Kimpflin shows that from a purely private industrial point of view the production of phenol is not a particularly profitable operation, 1,000 kilos of coal yielding 45 kilos of tar. The latter contains 360 grams of phenic acid, 75 per cent. of which—*i.e.*, 270 grams—is only obtainable by costly and complex treatments.

However, M. Kimpflin states that it is out of the question to abandon an industry deemed of vital importance on grounds of national defence. Besides which, the new industry of artificial resins opens to phenols and creosols an outlet by no means negligible.

Ten Years' Progress

Ten years ago the treatment of the by-products of coal distillation was limited, so far as tar is concerned, to light oils, naphthalene and naphthalene oils, anthracene and anthracene oils—pyridine and benzene being only very exceptionally manufactured. In 1914, under the pressure of war necessities, the extraction and complete purification of these substances were organised, and this was the starting point of the phenol industry.

The extension that has since been realised is largely due to the "Société d'Éclairage, Chauffage et Force Motrice," which in a factory at Gennevilliers delivered to the "Service des Poudres," during the hostilities, no less than 25,381,036 kilograms of chemicals, including 1,341,272 kilos of crystallised phenic acid, 1,491,777 kilos of metacresol, 81,808 kilos of orthocresol, 3,085,369 kilos of cresol for the recuperation of ethero-alcoholic vapours, 6,275,950 kilos of raw benzol, 7,150,370 kilos of sulphuric acid and 3,176,172 kilos of purified naphthaline.

The factory, through the researches of M. A. Baril, achieved a number of notable technical successes, including a contraction of the distillation interval and the more effective separation of phenol from its superior homologues, with "neighbouring" boiling points. One of the improvements had an important economic bearing. In the liberation of phenol, through the action of an acid on sodium phenate, carbonic acid produced by a lime kiln was substituted for the sulphuric acid habitually employed. Instead of comparatively valueless ***sulphate***, ***carbonate*** of soda was thus obtained, and soda of appreciable value easily recuperated by the agency of the lime.

Advantage to Pure Chemistry

Pure chemistry has also profited by this technical progress. M. Baril has carefully observed what takes place when distillation is effected in inclined chambers as compared with horizontal retorts, and his deductions are not favourable to the hypothesis of Bethelot that phenol is formed by synthesis during coal distillation. The chemists who consider that it is derived from more complex bodies by dehydrogenation or by the action of hydrogen will, therefore, be encouraged to adhere to their theory.

These researches of M. Baril have also definitely furnished the value of an important constant not only of phenol but of meta-cresol. This is the fusion point. Instead of being equal to 42° for phenol, according to previous estimations, it is really 40°85. As to meta-cresol, figures so wide apart as 10° and 40° were indicated. When pure, this body melts at 12°.

The Haber and Casale Processes

In addition to the various existing and proposed factories operating the Claude process, the German Haber process, the rights of which the French acquired under the Treaty of Versailles, is being installed at the Toulouse gunpowder factory. The yearly output from this plant, it is estimated, will be about 25,000 tons of combined nitrogen, and will probably later reach 30,000 tons.

The Casale process, deriving its raw nitrogen from coke oven and water gas, is to be exploited by the licensees, the Compagnie d'Alais, Froges et Camargues in various districts. About 9,000 tons of nitrogen will be fixed in the form of ammonia, but 12 months or more will elapse before the plants are in working trim.

The Fauser process is also to be developed in France. This process resembles that of Haber in some respects and utilises electrolytic hydrogen (see The Chemical Age, July 14, 1923).

Manufacture of Lithopone

The factory of the metallurgical company known as the Société des Usines Métallurgiques de Bouchain, in the Nord Departement, the plant of which had been destroyed during the war years by the invading armies, in December next will resume its manufacture of zinc white. A few months later the lithopone installations will be reopened. The processes that will be applied are said to be completely new and will allow of an output equivalent in all respects to the Dutch article. This production will reach 12 to 15 thousand tons. In French chemical circles rumour credits the company with the intention of amalgamating with the Zinc Colour Co. (Société des Couleurs Zinciques), which has already a monopoly of the sale of its products.

Chemical Tests for Exports to Sweden

The Swedish Government Testing Institute, Stockholm, Sweden, announces that exporters from other countries may submit to that institute samples of any materials concerning which there may be any doubt as to their conforming technically with Swedish import regulations, for examination. The institute was opened in 1920 with new and modern laboratories to continue and develop the work of the former testing institute of the Technical High School, which at the same time ceased to exist. The aim and work of the institute is to carry out impartial and expert testing and examination of industrial raw products and finished goods as to their mechanical, physical, and chemical properties. All results of tests for clients are strictly confidential. Information as to service and charges may be obtained by communicating with the Government Testing Institute, Stockholm, Sweden.

Leather and Gelatin Chemistry

The Division of Leather and Gelatin Chemistry of the American Chemical Society held a very successful and well attended meeting at Ithaca, U.S.A. Unusually interesting discussion followed the papers dealing with quinone and formaldehyde tanning and with the factors responsible for the greater shoe comfort of vegetable tanned leather as against chrome leather. A display was made of hydrogen electrode vessels designed especially for use with tannery liquors. It was voted that the next meeting of the Division should be held at Los Angelos the week of August 3, 1925.

Institute of Chemistry

Opening Meeting of Bristol Section

THE opening meeting of the session of the Bristol and South-Western Section of the Institute of Chemistry was held at Seale Hayne College, Newton Abbot, on Saturday, September 20. The visitors inspected the farm and the laboratories at the college before the meeting. Mr. C. J. Waterfall, F.I.C., of Bristol, occupied the chair, and others present included Messrs. E. Russell, Bristol City Analyst; T. Tickle, Public Analyst for the City of Exeter and the County of Devon; A. H. Mitchell, Tiverton Borough Analyst; M. W. Jones, chairman of the Bristol Section of the Society of Chemical Industry; A. Marsden, assistant engineer, Bristol Gas Co.; F. Southerden, J. Dutton and A. W. M. Wintle, F.I.C., chief chemist, United Alkali Co., Bristol, the hon. secretary.

The Chairman made sympathetic reference to the death of two of their members, Professor Wertheimer and Mr. G. M. Tinckwell. The professor, he said, was in a sense the founder of that branch, and was the oldest member of the Institute in the West of England. Mr. Tinckwell was one of the staff of the Cotham Secondary School at Bristol. The vote of sympathy was passed by the members standing in silence.

Experiments with Fertilisers

Dr. Ernest Vanstone, M.Sc., F.I.C., described experiments he had carried out at Seale Hayne College during the last six months on basic slags and rock phosphates. The value of phosphatic manures on grass and arable land, he said, was well recognised by most farmers. Experiments in various parts of the country had shown that after the application of the phosphates such as basic slag there followed a great increase in the live-weight gain of sheep and cattle, increased milk production, increased hay crops by as much as 10 cwt. to the acre, and a gain in the fertility of the soil, so that fertility increased year by year. These results were brought about chiefly with the high-grade basic slag of pre-war days. To-day this class of slag was difficult to obtain, and the farmer had to choose from bone manures, superphosphate, low-grade basic slags and ground rock phosphates.

The farmer's choice might be guided by the fineness of the fertiliser for one thing and the percentage of total phosphate for another. He would find that it was possible to obtain as much phosphate in 5 cwt. of a rock phosphate as in a ton of low-grade slag. He wished to know which fertiliser would act most rapidly, and he had a right to look to the chemists to answer that question. Dr. Vanstone did not know if the chemists had succeeded in giving the advice sought or been able to tell the farmer which would give up its phosphates to the plant most readily. To distinguish basic slags from adulterations with rock phosphates the well-known test with citric acid was introduced. The impression had since grown that this test also indicated the manurial value of the fertiliser. On that point there was much difference of opinion in spite of a very large amount of research work, and it was that problem that was being studied in the chemical department of the Seale Hayne College. The solubility in citric acid of phosphates of lime, iron and aluminum, of basic slags and of rock phosphates had been investigated. It had been shown that basic slags, like pure phosphates, had the same solubility no matter how much was taken for the test, but rock phosphates behaved quite differently. Rock phosphates were, however, soluble to a large extent; better than low-grade slags but inferior to slags of high-grade. Basic slags evidently consisted of mixtures of phosphates, some of which were very soluble and some only soluble to a very much less extent. That was different from what had been understood previously. The results of the experiments were of great importance and showed the need for large-scale experiments with these cheaper and richer rock phosphates.

In the course of discussion, Mr. Dutton said the citric acid test was very valuable in detecting the addition of a considerable amount of mineral phosphate with basic slag. Some thousands of tons of slag adulterated with mineral phosphates had been sent into that district. The makers denied the existence of the mineral phosphates, and threatened him with an action for libel, but eventually they made some compensation to the farmers who had been relying on the adulterated stuff. He asked what methods had been tried for the separation of basic slag from mineral phosphates. He had tried several, but none of them was really satisfactory, but the citric test was very valuable.

Dr. Vanstone said that the citric acid test had not been understood. He had undertaken no tests to mechanically separate basic slag from rock phosphates.

Australia's Mineral Resources

COMPLETE figures relating to Australia's mineral production for the year 1922 have just been published. While the position of Australia's mineral industry for that period cannot be called satisfactory, it is estimated that enormous resources are still untouched and the mining industry in general badly needs some stimulating influence. The values of some of the principal minerals produced during 1922 are shown in the following table:—

	£
Alunite	950
Antimony and ore	22,966
Arsenic and ore	37,922
Asbestos	19,018
Barytes	6,176
Bismuth and ore	1,525
Chalk, talc, soapstone, etc.	1,345
Chromite	1,095
Cobalt ore	20,332
Copper (ingot matte), copper ore	844,126
Diamonds	1,300
Diatomaceous earth	1,041
Dolomite	800
Felspar	525
Fireclay	3,708
Fluorspar	—
Fuller's earth	102
Graphite	103
Gypsum	42,730
Iron	248,909
Iron ore and flux	59,451
Iron oxide	1,745
Kaolin	5,292
Lead	448,888
Limestone flux	77,414
Magnesite	4,473
Manganese ore	13,061
Mica	2,285
Molybdenite	3,611
Ochre and other pigment clays	1,165
Opal	15,650
Osmiridium	35,512
Phosphate	5,107
Platinum	1,182
Pyritic ore	22,823
Salt	109,478
Shale	60,741
Silica	885
Tin and tin ore	395,755
Wolfram	1,682
Zinc and concentrates	1,157,458

Purifying London's Water

THE germ-destroying qualities of chlorine have been long realised, but their application on a large scale is of comparatively recent date, says *The Engineer*. Indeed, in the case of the Metropolitan supply it was the direct result of the war.

Desirous of saving as much of the cost of pumping water into the reservoirs as he could and of lessening to the utmost the consumption of coal when it was scare and dear, Sir Alexander Houston set himself to ascertain whether effects equally good as regards sterilisation might not be obtained by treatment with chlorine as with lengthened storage in reservoirs. The results he achieved have been astonishing. Since the commencement of the treatment, some eight years ago, the gross calculated saving has been no less than some £120,000, in consequence of reduced pumping, while at the same time the extreme purity of the water distributed to consumers, for which London is justly famed, has been fully maintained.

The main sources of London's supplies are anything but unpolluted, yet the fact remains that the water as it reaches the consumer is of outstanding purity. With the Thames, apparently, no "taste" troubles have been experienced as the result of applying the chlorine treatment, and millions of people have, for some years past now, been using chlorinated water without knowing it, and with no complaints as to taste.

From Week to Week

A SUGAR BEET FACTORY, costing £250,000, is to be erected in Essex.

THREE MEN WERE KILLED in the course of their employment in the chemical industry during last month.

THE DATE for closing the British Empire Exhibition at Wembley has been definitely fixed for November 1.

MODERN CHEMICAL PLANT will be sold by auction at Victors, Ltd., Sutton Oak, St. Helens, on Wednesday, October 15.

ETHER PLANT, HYDRO-EXTRACTORS, and other plant will be sold by auction at Stratton Works, Swindon, on October 10.

THE PRODUCTION OF ATMOSPHERIC NITROGEN by means of hydro-electrics is reported in two instances in the Dutch West Indies.

AN OIL TANK OF 2,000,000 GALLONS CAPACITY, belonging to the Burmah Oil Co. at Rangoon, was fired by lightning on September 19.

PROFESSOR W. E. S. TURNER, D.Sc., M.Sc., secretary of the Society of Glass Technology, Sheffield, is on a tour in the United States.

FREE IMPORTATION OF INSECTICIDES and fungicides into Brazil has been recommended by the President of Brazil in a message to the National Congress.

PROFESSOR HABER is at present in America, and will later visit Japan. One of the objects of his visit is the study of electric-power production at Niagara Falls.

COURTAULD'S, LTD., announce that a new factory is to be erected at Wolverhampton. When the new works are in full swing they will give employment to between 3,000 and 4,000 people.

PROFESSOR EDWARD HART is to be honoured by a three-day celebration from October 16 to 18, in recognition of his 50 years of continuous service in the Department of Chemistry at Lafayette College, U.S.A.

DYE FROM ARTIFICIAL POPPY WREATHS has stained the white Portland stone of Hull's cenotaph. The dye is said to have penetrated to a depth of a sixteenth of an inch, and is causing great difficulty in removal.

DR. J. B. LACROIX has been appointed head of the new school of chemistry and experimental physics established at Laval University, Quebec. Dr. Lacroix has been studying in Europe for the past six years.

MR. R. H. MANSKE, M.Sc., 1924, of Queens' University, Canada, has been awarded an 1851 scholarship in Chemistry. Mr. D. C. Rose, M.Sc., 1924, of Queens' University, has also received a similar award in Physics.

THE FRENCH *Journal Officiel* of September 20 contains a decree putting a tax of 26 per cent. as from October 1 on all goods of German origin or manufacture imported either direct from Germany or through a third country.

THE DEATH IS ANNOUNCED of Mr. G. H. France, of Leafield House, Yeadon, a principal in the firm of Hill, France, and Gardiner, dyers and finishers, of Yeadon. Mr. France was also a director of the Bradford Dyers' Association.

THE DEATH HAS OCCURRED at Westmoreland House, Low Fell, Gateshead, of Mr. Benjamin Noble, at the age of 91. He was a director of Sowerby's Ellison Glass Works, Ltd., and Locke, Blackett and Co., lead manufacturers.

AT DEGANWY LAST WEEK, the death took place of Mr. R. K. Hartley, who had been associated for 58 years with McDougall and Robertson, chemical manufacturers, of Middleton, near Manchester. Mr. Hartley was the inventor, in 1889, of the free wheel.

Mr. H. E. Alcock, chairman and managing director of B. Laporte, Ltd., who was taken suddenly ill at Bournemouth on September 3 is, we are pleased to be able to state, now well on the way to recovery from the surgical operation which was found to be necessary.

A CONFERENCE on the wages dispute in the dyeing, bleaching and finishing industry, held in Manchester on September 19, failed to reach an agreement, and there is a prospect of a strike. About 80,000 workers in Lancashire, Yorkshire, Derbyshire, Cheshire, and parts of Scotland are involved.

UNEMPLOYMENT IN THE CHEMICAL MANUFACTURING INDUSTRY in Great Britain and Northern Ireland on August 25 totalled 7,750 men and 1,559 women. These figures represent a slight decrease on the previous month in the case of the men, but a slight increase in the number of women unemployed.

DR. A. SCHEDLER, of the Clayton Aniline Co., Ltd., of Manchester, has been appointed Swiss Consul in Manchester, with offices at 11, Albert Square.

IN THE CHEMICAL INDUSTRY during the first eight months of this year there were eight trade disputes, involving 1,000 men, and an aggregate duration in working days amounting to 10,000. In a similar period last year, ten disputes involving 2,000 men produced a total of 19,000 working days involved.

MESSRS. J. AND A. CHURCHILL hope to publish early in the New Year a *Dictionary of Perfumery*, by Ernest J. Parry, B.Sc., F.I.C., F.C.S. The work will be in two volumes. It will deal with the raw materials of the perfumery trade and with allied subjects from the points of view of the chemist, the manufacturer and the user.

AUTOMATIC AND ELECTRIC FURNACES, LIMITED, of Elecfurn Works, 173-175, Farringdon Road, London, state that with a view to further developing their electric furnace business in France, French possessions, and countries under the protection of France, "La Compagnie Francaise Wild-Barfield" has been formed with offices at 102, Rue Faubourg Poissonniere, Paris.

THE DIRECTOR OF INDUSTRIES, Bombay, has awarded a State Technical Scholarship to Mr. R. G. Pradhan for the study of sugar technology, including sugar chemistry, engineering and agriculture in the Audubon Sugar School of the University of Louisiana. The scholarship is of the value of £240 annually, with fees and travelling expenses in addition, and is tenable for two years.

MR. E. CRAIG PORTER, B.Sc., Ph.D., has been appointed works chemist at the factory of Lotus, Ltd., Stafford. Mr. Porter took his science degree at Manchester University, graduating in technical chemistry, and his Ph.D. degree was conferred as the result of research work on hide substances in the Leather Department of Leeds University under Professor Procter.

SIR JAMES HINCHLIFFE, president of the British Research Association for the Woollen and Worsted Industries, speaking at Edinburgh on September 19, said that when the Association was formed not one firm in a 100 had a laboratory. They were attempting to do collectively what the smaller firms could not do individually in the matter of technical and scientific research.

THE TRADES OF FAT MELTER, fat extractor, glue maker and size maker are to be included in the list of offensive trades at Yeovil in consequence of an order made by the Town Council under the Public Health Acts Amendment Act being now confirmed by the Ministry of Health. These trades also formed the subject of a recent application by the Melksham (Wilts) Urban Council.

IMPORT DUTIES ON COAL-TAR INTERMEDIATES and on finished dyestuffs will, under the provisions of the U.S.A. Fordney Tariff Act of 1922, be automatically reduced on September 22 from 55 to 40 per cent. and from 60 to 45 per cent. *ad valorem*, respectively. The specific additional duty of 7 per cent. per lb. on both classes of products will be continued without change.

LEEDS UNIVERSITY AUTHORITIES are taking considerable interest in the proposal to establish a professorship in Cement Engineering. If the proposal, which has not yet been officially considered by the authorities, matures it will probably take the form of an endowment of a Chair of Civil Engineering, having as an important part of its functions the conduct of teaching and research in the manufacture and uses of cement.

REPORTS STATE THAT a large proportion of the new nitrate grounds offered by auction by the Chilean Government last week were secured by United States interests. The only indication of the British purchases is the announcement by the Salar del Carmen Nitrate Syndicate of the purchase of two plots of land adjoining their present properties. The nitrate contents of the new area are estimated at 1,756,200 metric or 3,817,826 Spanish quintals.

THE MINISTRY OF AGRICULTURE announces that the Government has decided to provide a further sum of £500,000 for agricultural education and research, in addition to the funds already available for that general object, amounting to £1,000,000, under the Corn Products Acts (Repeal) Act, 1921, and about £400,000 per annum from other Government funds. This further amount will be provided for use during the next five years.

THE AMERICAN CELLULOSE AND CHEMICAL MANUFACTURING CO., LTD., is completing new plant at Amcelle, near Cumberland, Md., U.S.A., and expects to commence active production shortly. The plant has been in course of construction for some months past, and will be given over to the manufacture of artificial or fibre silk; it is said to represent an investment in excess of $5,000,000. The company will operate with an authorised capital of $25,000,000 and 220,000 shares of common stock, no par value. Dr. Camille Dreyfus is president, and Mr. A. J. Fitch works manager.

DR. ALFRED W. G. WILSON, of the Mines Branch of the Canadian Department of Mines, and Mr. Wyatt Malcolm, of the Geological Survey Branch, who have been in this country during the summer for the purpose of affording information to financiers, mining engineers and others contemplating the investment of funds or the initiation of new enterprises in Canadian mining, are returning to Canada on October 9. Persons desirous of interviewing them prior to their departure should communicate with them at once, care of the High Commissioner for Canada, Kinnaird House, Pall Mall East, London, S.W.1.

THE FOURTH YEAR of the British Phosphate Commission's control of the Nauru and Ocean Island phosphate deposits ended on June 30 last. The total shipments for the year were 451,909 tons, which constitutes a record, being 87,000 tons more than the best previous year in the history of the two islands. In the four years from July, 1920, to June, 1924, under the Commission's control, the total output from the two islands reached 1,491,577 tons. This quantity was apportioned as follows:—Australia, 960,677 tons; New Zealand, 168,000 tons; United Kingdom, 32,300 tons; other countries, 330,600 tons.

A GENERAL DISCUSSION on "The Physical Chemistry of Igneous Rock Formation" is to be held in the rooms of the Geological Society, Burlington House, London, on Wednesday, October 22, beginning at 3 p.m. The meeting is being organised under the joint auspices of the Faraday Society, the Geological Society, and the Mineralogical Society. A general introduction will be contributed by Dr. J. S. Flett, and papers are expected from Professor C. H. Desch, Dr. J. W. Evans, Professor J. W. Gregory, Mr. A. F. Hallimond, Professor Paul Niggli, Dr. A. Richardson, Dr. A. Scott, Mr. G. W. Tyrrell and Dr. W. E. S. Turner. Further particulars relating to the meeting may be obtained from Mr. F. S. Spiers, 90, Great Russell Street, London, W.C.1.

THE PRESIDENT of the Society of Chemical Industry (Mr. W. J. U. Woolcock) will give an address on "Chemistry and Industry" at the opening meeting of the Manchester Section session, to be held on Friday, October 3, at the Textile Institute, St. Mary's Parsonage, Manchester, at 7 p.m. In his address he will emphasise the importance of close co-operation between the scientist and the industrialist and will deal with the progress made in this direction. Members of the Manchester Pharmaceutical Association have been invited to this meeting, and non-members who send a stamped addressed envelope to the secretary, Mr. Guy Radcliffe, will also receive an invitation. On November 7 the Manchester Section will hold a joint meeting with the local sections of the Institute of Chemistry, the Society of Dyers and Colourists, and the Manchester Literary and Philosophical Society. The speaker will be Sir William Willcox.

THE DEATH took place at his residence, The Gables, Botanic Avenue, Belfast, on September 12, of Mr. Samuel Templeton, A.R.C.Sc.I., F.I.C., a distinguished Belfast scientist. Mr. Templeton, who was born in 1861, received his early chemical training under the late Professor Barkley, formerly the City Analyst for Belfast. His distinguished career at the Royal College of Science, Dublin, where he was a Royal Scholar (1882–84) culminated in the Associateship of the College and of the Institute of Chemistry (1884). After some years' experience as a works chemist, Mr. Templeton founded the Belfast School of Applied Chemistry, and also practised extensively as a consultant. In 1901 when the Municipal Technical Institute was opened Mr. Templeton became the chief lecturer in Chemistry and head of the Chemical Department. He retired from this post after several years' service in order to resume his work as a consulting chemist. Mr. Templeton took a keen interest in the welfare of the Belfast and District local section of the Institute, whose meetings have been held for some years in a room at his laboratories.

The Use of Mineral Fillers

A STUDY of the size and character of grains of non-metallic mineral fillers has been completed by the U.S.A. Department of the Interior at one of the stations of the Bureau of Mines. Mineral fillers are those non-metallic minerals that, after being pulverised, are used in the preparation of various manufactured articles. Kaolin, whiting, chalk, ground limestone and marble, silica, ocher, mica, talc, barytes, slate flour, graphite and diatomaceous earth are the chief mineral fillers. Different forms of some of these minerals are employed; as, for example, silica may be ground quartz, or pumice, or tripoli, the fine rounded grains resulting from the weathering of chert.

Each mineral has properties that make it suitable for certain uses. These properties are colour, specific gravity, the nature of the surface, and the shape and, probably of greatest importance, the size of the particles. Most fillers are used essentially as inert substances to occupy space, fill voids, or impart colour, but in some lines of manufacture they have an important but not easily understood effect on the physical properties of the finished article. For example, ground barytes and marble, apart from their specific gravity, have particles that are much alike in appearance and shape, and yet the properties they impart to a rubber compound are quite different. Of great importance in the comparison of fillers from the same mineral, and to a less degree of fillers from different minerals, are the average particle size, the variation in size from maximum to minimum, and the proportionate amounts of the different sizes. The shape of the grains ranks second and applies more especially to the comparison of fillers from different minerals.

Although fillers are used in a great number of industries, the bulk of the material goes into the following products: paper, wall-paper, prepared roofings, rubber, paint, linoleum, oilcloth, foundry facing, plastic cements, oxychloride cement artificial stone, polishes and scouring compounds, matches, dressing and dusting powders, various textile products, such as window shade cloth, and phonograph records.

Details of methods of determining the average particle size and proportions of grains of different sizes are given in Techtical Paper 296, by Mr. W. M. Weigel, mineral technologisn, copies of which may be obtained from the Department of the Interior, Bureau of Mines, Washington, D.C., U.S.A.

Arsenic in Borax Case

AT the Mansion House on Tuesday, before the Lord Mayor, the International Drug Company, of 16, Queen Victoria Street, pleaded "Guilty" on a summons alleging that they had sold purified borax adulterated with arsenic to the amount of 120 parts per million in excess of the five parts per million allowed by the British Pharmacopœia. Mr. W. N. Earle, prosecuting for the Corporation, said purified borax was used in lotions, ointments, and sometimes internally, and it was of the highest importance that it should not include more than the infinitesimal quantity of arsenic permitted by the British Pharmacopœia. He was not suggesting that any danger had arisen. Mr. Glyn-Jones, for the defence, said it was a case of commercial borax being supplied instead of the purified borax applied for. Borax was occasionally used as a mouth wash, but the amount in this instance was so negligibly microscopic that no harm could have arisen if a pound and a half had been consumed. All the adulterated borax had now been destroyed. The Lord Mayor fined the company 40s., and ordered them to pay £2 2s. costs.

Methylated Ether Prices

MAY AND BAKER, LTD., announce reduction in prices of methylated ethers in consequence of the lower price for methylated spirit. The present rates are now as follows:—

Ether Meth.	In W. qts.	Not less than 12 W. qts.	In drums or carboys
s.g. ·750	1/2	1/1½	1/1 lb.
·735	1/2½	1/2	1/1½ ,,
·730	1/2½	1/2	1/1½ ,,
·725	1/4½	1/4	1/3½ ,,
·725 Triply Rect.	1/9	1/8½	1/8 ,,
·720	1/5½	1/5	1/4½ ,,
·717	1/11½	1/11	1/10½ ,,
Ether Purif ·720 ex Meth. Spirit (Aether P.B. 1914)	2/3	2/2½	2/2 ,,

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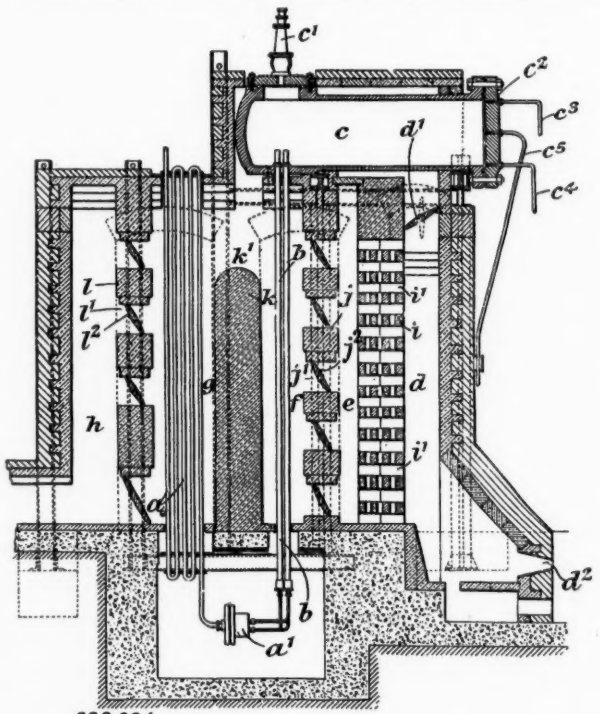
Patent Literature

Abstracts of Complete Specifications

220,664. Liquid Hydrocarbons, Treatment of. S. J. M. Auld, 23, Great Winchester Street, London, E.C.2, A. E. Dunstan, and P. H. Herring, Meadhurst, Cadbury Road, Sunbury-on-Thames. Application dates, February 20 and November 29, 1923.

The apparatus is particularly for the treatment of heavy asphaltic residues to obtain light spirit, and to render the ultimate residue less viscous and more useful as a fuel oil. The process is a single cycle type of pressure cracking in the liquid phase, in which the liquid is preheated and passed at high velocity through heating tubes before issuing into a large closed vessel in which the cracking takes place under pressure.



220,664

In the preheating stage the liquid is heated to within 25° C. of the cracking temperature, and then passes through heating tubes of about 1–1·5 inches diameter and 10–20 feet in length. The temperature at this point is substantially, *i.e.*, about 20° C. above the ultimate cracking temperature. It is found that no deposition of carbon takes place on the heating tubes. The yield of lighter oils depends upon this difference of temperature as well as the time during which the oil is maintained at the higher temperature. It is found that for each hydrocarbon oil there is a definite time-temperature ratio corresponding to a given yield of light oil. The products of cracking are maintained dissolved in the liquid as far as possible, and the yield of light products is restricted to enable a relatively low cracking temperature to be employed. As an example, about 10–15 per cent. of gasolene having an end boiling point of 175° C. is obtained by employing a pressure of 350–450 lbs. per square inch.

The preheater *a* comprises a number of vertical tubes, which, with the subsequent heating tubes *b*, are mounted in communicating vertical flues *f*, *g*. The preheater *a* is composed of a continuous tube of 1 inch diameter, and the heating tubes may be 1·5 inches diameter. The oil passes upwards through the latter into a vessel *c* having a safety valve c^1 and an outlet pipe c^3 for vapour and liquid. Carbonaceous matter which accumulates in the vessel *c* is periodically withdrawn by the pipe c^4. The vessel *c* is subjected to the heating gases, which pass upwards through a vertical flue *d* controlled by a damper d^1, and thence to the top of the flue *g*. The wall *i* of the flue *d* is constructed of open brickwork through which the hot gases pass to a flue *e*, which is separated from the flue *f* containing dampers j^2 to regulate the temperature of the tubes *b*. A similar wall *l* may be provided to regulate the flow of gases to the outlet flue *h*. The temperature in the tubes *a* is about 350°–370° C., in the tubes *b* up to 410° C., and in the vessel *c* about 390° C., the pressure being 350–450 lbs. per square inch. Particulars are given of the application of the process to gas oil of Persian origin, Scottish shale oil, and Mexican heavy asphaltic base residue.

220,676. Gas Manufacture. N. Nielsen, 13, Firs Avenue, Muswell Hill, London, and B. Laing, Abdale House, Hatfield, Herts. Application date, March 21, 1923.

In distillation processes in which water-gas is passed through a retort in which carbonaceous material is distilled, an increased yield of gas is obtained by using the blow gas which is formed in water-gas production. Bituminous coal is distilled in a retort by means of the sensible heat of water-gas produced from the resulting coke. The producer is run in such a way during the blow period, that the blow gas, instead of consisting of carbon dioxide and nitrogen, consists of carbon monoxide, hydrogen, nitrogen, and a small percentage of carbon dioxide. This blow gas may be used in the manufacture of hydrogen simultaneously with the distillation process, by passing it through a container filled with heated iron oxide. The oxide is reduced to iron, and superheated steam is then blown through it whereby hydrogen is liberated. The steam may be superheated in chequerwork brick chambers, in which the residual blow gas is burnt after being used for reduction purposes. The hydrogen thus obtained is mixed with the combined retort and water-gas after tar oils, etc., have been removed from the latter. The gas obtained contains a lower proportion of carbon monoxide. By this process, one ton of bituminous coal yields about 5,000 cubic feet of rich distillation gas containing 6–8 per cent. of carbon monoxide by primary distillation, 34,000 cubic feet of water-gas obtained from the coke and containing about 42 per cent. of carbon monoxide, and 14,000 cubic feet of hydrogen containing no carbon monoxide. The total quantity of gas thus obtained per ton is about 53,000 cubic feet containing 25 per cent. to 27 per cent. of carbon monoxide instead of the usual 40 per cent. to 45 per cent.

220,714. Classification and Concentration of Ore Bearing Material. J. F. Newsom, Kuala Lumpur, Federated Malay States. Application date, May 23, 1923.

This ore classifier consists of a box, the upper part of which is rectangular in horizontal cross section, and the bottom of which is formed as a number of hoppers. The ore-bearing current is directed horizontally into the box near the top, and a current of water is also introduced into the box parallel to and just below the ore current. It is found that return and eddy currents are thus avoided, and the bulk of the minerals settle in comparatively few rows of the hoppers. The waste material is distributed over a much larger zone.

220,716. Recovery of Values from Mixtures containing the same, Process for. B. E. Eldred, 30, Nassau Drive, Great Neck, Long Island, New York. Application date, May 23, 1923. Addition to 199,753.

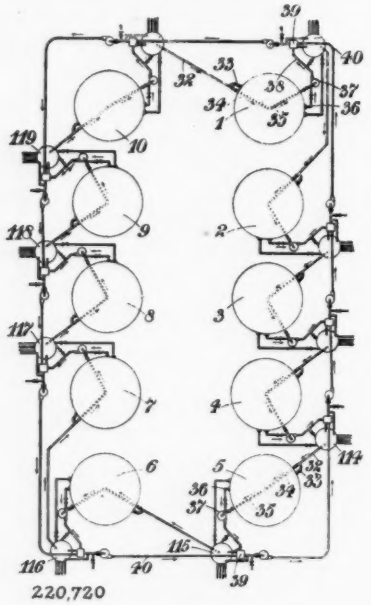
Specification No. 199,753 (see The Chemical Age, Vol. IX, p. 128) describes a method of floating and recovering values from mixtures, the raising of the particles to the surface being effected by the autogeneous density change caused by subjecting the mixture to a partial vacuum. In this invention, the values are formed into a agglomerated layer, and retained at the surface of the liquid by the introduction of an oil into the separation chamber. The layer of agglomerated particles is readily removed.

220,720. Leaching Systems, Particularly for Copper. W. G. Perkins and Metals Production, Ltd., 62, London Wall, London, E.C.2, and T. J. Tapling, jun., 16, Lordship Park, Stoke Newington, London, N.16. Application date, May 24, 1923.

This is an improvement in the process of leaching of copper ores with an aqueous solution of cupric ammonium carbonate, or a solution containing ammonia and carbon dioxide with access of air. Such a process is described in Specifications

Nos. 185,242 and 190,246 (see THE CHEMICAL AGE, Vol. VII, p. 503, and Vol. VIII, p. 67). When the ore in a number of vessels is subjected to successive leaching operations with a number of ammoniacal solutions, the rate of passage through all the stages must be the same unless storage volume is provided in intermediate vessels. In this invention, a charge of the richer ore is leached in a solution containing a high percentage of ammonium carbonate, which is repeatedly circulated through the leaching tank, through a storage tank, and through an aerator, so as to dissolve about 80 per cent. of the copper. The solution thus obtained may contain about 5 per cent. of copper, which may be increased to 6 per cent. by passing it over a further charge of fresh ore.

The apparatus comprises a series of leaching vessels 1, 2, 3—10 with solution supply vessels 119 between them. The solid material remains in the tanks, and is subjected to suc-



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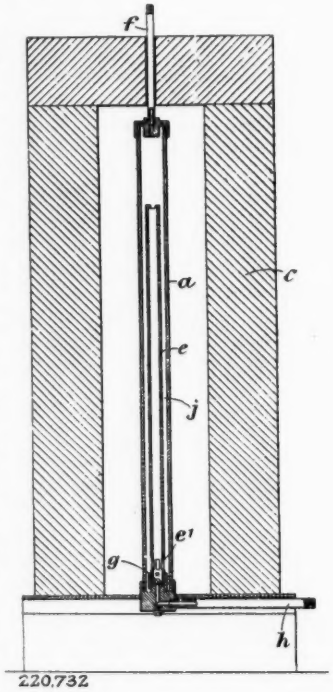
cessive treatment with different liquors. Assuming that the ore in the vessel 1 is exhausted of copper, this ore is washed with water by percolation. The tank 2 may contain 0·2 per cent. of undissolved copper which is treated with cupric ammonical solution containing 0·2 per cent. of ammonia, 0·16 per cent. of carbon dioxide, and 0·1 per cent. of cupric copper. This liquor passes to tank 3 which is richer in copper, and so on. Ammonia or ammonium carbonate may be added to the liquor before passing into each tank. The tank 8 contains the richest ore, and the liquor then contains 5 per cent. of ammonia and is circulated through the ore until it contains 5 per cent. of copper. Aeration of the liquor is necessary with all the richer ore charges. The tank 10 is empty, and tank 9 is filled with fresh ore to commence the cycle, when tank 1 is cut out of operation and tank 2 is subjected to washing. The pipe connections for all the tanks are identical, *e.g.*, the tank 5 receives leaching liquor from tank 114 through pipe 32 having branches 33, 34 so that the liquor may be supplied to the top or bottom. Corresponding outlet pipes 35, 36 are provided leading to a centrifugal pump 37, and thence to a centrifugal aerator 39. Air is supplied to the aerator by pipe 40, and the liquor passes out to a supply tank 115. The quantity of air required for aeration is about 70 times the volume of the solution. Pipes are also provided for withdrawing the liquor after the final leaching, for supplying strong ammonia, for supplying weak leaching liquor, and for supplying wash water. The strong liquor is heated to recover the ammonia and precipitate the copper oxide. An alternative leaching system is also described.

220,721. ESTERS, MANUFACTURE OF. H. Wade, London. From S. Karpen and Bros., 678, West 22nd Street, Chicago, Ill., U.S.A. Application date, May 24, 1923.

Esters are obtained by the reaction of a halogenated saturated aliphatic hydrocarbon and a metallic salt of an acid, in the esence of a solvent consisting of a lower monohydric alcol and a substantial proportion of water. In an example, a vent consisting of methyl alcohol and water in equal pr tions is saturated with methyl chloride (*i.e.*, about 30 to imes the volume of methyl chloride). Sufficient sodium ate is added to combine with the methyl chloride and mixture is heated to 100° C. in a closed vessel for 6–8 s, when the reaction between the methyl chloride and t odium acetate is complete. The pressure is high at first, l gradually decreases. If the reaction is effected at 150° ., it may be completed in 5–10 minutes. Other halogena d hydrocarbons may be employed in a similar manner. The product is methyl acetate and sodium chloride. Othe amples of the process are given, including the treatment sodium bromide or iodide with methyl chloride to obta methyl bromide or iodide. The latter may then be treated with sodium acetate according to the present process to obtain methyl acetate and sodium iodide. By this process natural as may be chlorinated to obtain methyl chloride, and the latter treated with sodium bromide or iodide to obtain methyl bromide or iodide, which could not be directly obtained from natural gas.

220,732. CRACK G OF HYDROCARBON ILS, AND TREATMEN F SOLID CARBONACE SUBSTANCES. Davidson, Home , Hatch End, Mid lex, and G. P. Lew Sherwood Cottage, N Denham, Uxbridge. Application date, May , 1923.



220,732

Liquid hydro arbons are cracked by p ssing them through molten in to obtain low-boiling products, and solid fuel such as coal may be similarly treated. The apparatus comprises a series of vertical tubes *a* in a furnace *c*. Each tube contains a smaller tube *e* open at the top and having slots e^1 near the bottom. The oil is admitted through a pipe *h* and non-return ball valve *g*. The metal is maintained at a temperature sufficiently high to crack the oil, *e.g.*, 400° C., and a pressure of 600 lbs. per square inch may be maintained. The molten metal circulates continuously downwards through the tube *e* and slots e^1, and upwards through the annular space *j*. The oil is carried upwards with the metal, and the product is drawn off through the pipe *f*. Coal or the like may be similarly treated by powdering and mixing with tar oil, which is then passed into the apparatus.

220,771. HYDROCYANIC ACID, CATALYTIC PRODUCTION OF. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. Application date, July 5, 1923.

A catalyst for the production of hydrocyanic acid consists of a form of alumina which has a vitreous surface and a microporous structure. This alumina is distinct from the ordinary chalky form, and from bauxite. It is obtained by precipitating aluminium hydroxide from an aluminium salt with ammonia, washing and drying the precipitate at 100° C. and heating it rapidly to a red heat. In this manner the mass breaks into smaller grains, and in this form is used as the catalyst. Hydrocyanic acid is obtained by the interaction of carbon monoxide and ammonia, and it is found that no deposition of carbon or liberation of free nitrogen takes place. Hydrocyanic acid may also be obtained by the dehydration of ammonium formate or formamide with the aid of this catalyst. These substances may be produced from carbon monoxide and ammonia by combination under pressure in

the presence of water. Hydrocyanic acid is formed rapidly at about 300° C., and secondary reactions do not occur.

220,807. AMMONIA, PROCESS FOR THE PRODUCTION OF. W. A. Nelson, 2301, Elliston Place, Nashville, Davidson Co., Tenn., U.S.A. Application date, August 20, 1923.

This process is for producing ammonia in the form of the hydroxide. It consists in bringing air, cla[y] and carbon into contact in the presence of moisture, and at a [high] temperature. The ammonia is absorbed in the water vapo[ur] and condensed. In an example of the process, a mixture of [ben]tonite 3 parts, gas carbon 1 part, is formed into a plastic m[ix]ture with water and is shaped into balls or rolls and placed [in] an iron electric furnace heated to 1,000° C. Air is drawn th[rou]gh the furnace, and ammonia is formed at temperatures a[bo]ve 460° C. The ammonia and water vapour are drawn o[ff] and condensed. The bentonite employed is a clay contai[nin]g leverrierite as its principal constituent, but ball clay, ka[o]lin or aluminum silicate containing hygroscopic water or wa[te]r of constitution which is not liberated below 200° C. may also be employed. The carbon may alternatively be in the form of powdered or granular wood charcoal or coke, or flake or amorphous graphite.

NOTE.—Abstracts of the following sp[e]cifications, which are now accepted, appeared in THE CHEMIC[AL] AGE when they became open to inspection under the Intern[ati]onal Convention: —202,283 (Texas Gulf Sulphur Co.), rela[ti]ng to the burning of sulphur, see Vol. VIII, p. 402; 21[9,]6[3]1 (L'Air Liquide Soc. Anon. pour l'Etude et l'Exploitati[on] des Procédés G. Claude) relating to the purification of il[lu]minating or coke oven gas or similar gases, see Vol. X, p. 620.

International Specifications not yet Accepted

219,635. INDIARUBBER. W. L. Utermar[k], 25, Okeghem Straat, Amsterdam. International Convention date, July 28, 1923.

Rubber latex is subjected to intensive centrifugation for a small number of revolutions (5,000–10,000) to separate it into two portions containing higher and lower proportions of solids. It is possible to obtain a portion containing 58%-60% of solids in this manner.

219,649. CATALYSTS. Soc. Chimique des Usines du Rhône, 21, Rue Jean-Goujon, Paris. International Convention date, July 26, 1923.

A catalyst for hydrogenation and reduction reactions is prepared by partly reducing copper oxide containing an alkaline substance. The latter may be a caustic alkali, including lithia, an alkaline earth, magnesia, zinc oxide, and basic salts, such as carbonates, phosphates, or borates of alkaline earth metals, and the quantity used may be 0·25%. The catalyst is obtained by precipitating cupric hydroxide, adding the alkali in dilute solution, and passing hydrogen over the mixture, at 80°-160° C.

219,653. UREAS AND DYES. Soc. of Chemical Industry in Basle, Switzerland. International Convention date, July 27, 1923.

Aminoaryl-pyrazolones are treated with phosgene in the presence of acid-binding agents to obtain the corresponding ureas. The urea of 1- (3¹-aminophenyl)-5-pyrazolone-3-carboxylic acid is described. These ureas may be coupled with two molecular proportions of the same or different diazoazo compounds to obtain tetrakisazo dyes. Alternatively, a diazoazo compound may be coupled with an amino-, nitro-, or acidylamino-arylpyrazolone, and the disazo dye treated with phosgene. In an example, the urea mentioned above is coupled with diazotized 4-amino-3-toluene-azo-2¹-toluene-4¹-sulphonic acid. In other examples, the urea of 1-(4¹-aminophenyl)-5-pyrazolone-3-carboxylic acid is coupled with diazotized 4-aminoazobenzene-3¹-sulphonic acid, or 4-amino-3-methoxyphenyl-azo-2¹-toluene-4¹-sulphonic acid. These dyes dye cotton yellow, brown, orange, red, or blue.

219,673. DYES. Farbwerke vorm. Meister, Lucius, and Brüning, Hœchst-on-Main, Germany. International Convention date, July 23, 1923.

Two molecular proportions of a nitroamino-diphenylamine sulphonic acid are condensed with one molecular proportion of a benzoquinone such as chloranil. Examples of such sulphonic acids employed are 4-nitro-4¹-aminodiphenylamine-2-sulphonic acid, and amino-anilido-dinitro-diphenylamine-*o*-sulphonic acid. These dyes give brown shades on wool and leather.

219,676. VANILLIN. Akt.-Ges. für Anilin Fabrikation, Treptow, Berlin. International Convention date, July 28, 1923.

Guaiacyl-trichloromethyl-carbinol is boiled with cupric acetate solution with introduction of air to oxidise it. Vanillin is obtained, and is extracted with ether or chloroform. To obtain the starting material, guaiacyl-trichloromethyl-carbinol, guaiacol is condensed with chloral hydrate.

LATEST NOTIFICATIONS.

221,772. Self-acting fire-extinguisher. Vezzani, A. September 12, 1923.

221,773. Process for the manufacture of high-percentage and pure solid hydrocarbons from tars. Rutgerswerke-Akt.-Ges. September 11, 1923.

221,780. Manufacture of sponge iron. Australian Minerals Recovery Co., Ltd. September 15, 1923.

221,802. Process for separating a mixture of zirconium and hafnium halogenides. Naamlooze Vennootschap Philips' Gloeilampenfabrieken. September 15, 1923.

221,809. Valves. Synthetic Ammonia and Nitrates, Ltd. September 10, 1923.

Specifications Accepted, with Date of Application

214,583. Gutta-percha, balata, and analogous vegetable resins, Manufacture of. K. D. P., Ltd., April 20, 1923. Addition to 213,886.

216,834. Separating the volatile ingredients of a liquid mixture, Method of and apparatus for. P. C. Lemale. June 1, 1923.

221,250. Gas purification, Process of and apparatus for. W. C. Holmes and Co., Ltd., and K. Cox. May 9, 1923.

221,256. Concentrated acetic acid, Process for the manufacture of. E. C. R. Marks (*Grasselli Chemical Co.*). May 30, 1923.

221,359. Dyeings on fibre, Production of. J. Y. Johnson. (*Badische Anilin und Soda Fabrik*). September 27, 1923.

221,380. Emulsions or solutions of tar or the like, Manufacture of. L. W. Low. November 7, 1923.

221,388. Carbonising, Process of. S. G. S. Dicker (*S.E. Co.*). Nov. 22, 1923.

221,418. Indigoid dyestuffs, Manufacture of. O. Y. Imray (*Soc. of Chemical Industry in Basle*). June 8, 1923. Addition to 214,864.

Applications for Patents

Austerweil, G. Production of terpene alcohols. 22,165. September 19. (Germany, September 19, 1923.)

Baddiley, J., British Dyestuffs Corporation, Ltd., Hill, J., and Riley, A. Manufacture of azo colouring-matters. 21,984. September 17.

Binz, A. Method of producing organic compounds. 22,178. September 19.

British Celanese, Ltd. and Ellis, G. H. Treatment of cellulose acetate. 22,153. September 19.

British Dyestuffs Corporation, Ltd., Fyfe, A. W., and Perkin, W. H. Manufacture of anthraquinone dyestuffs. 21,983. September 17.

British Dyestuffs Corporation, Ltd., and Mudford, H. D. Dyeing fabrics containing acetyl silk. 22,163. September 19.

British Oil Products Co., Ltd. Treatment, etc., of enamels, etc. 21,820; 21,821. September 16.

British Synthetics, Ltd., and Higgins, E. B. Manufacture of azo dyestuffs, etc. 21,862. September 16.

Courtaulds, Ltd., Glover, W. H., and Weyenbergh, E. van. Production of cellulose compounds. 21,753. September 15.

Farbwerke vorm. Meister, Lucius, and Brüning. Manufacture of vat-dyestuffs containing sulphur. 21,758. September 15. (Germany, September 19, 1923.)

Farbwerke vorm. Meister, Lucius, and Brüning. Manufacture of condensation products of the anthraquinone series. 21,876. September 16. (Germany, September 18, 1923.)

Harris, H. Treatment of alkali solutions containing tin. 22,054. September 18.

Harris, H. Treatment of alkali liquors. 22,238. September 20.

Hirzel, H. Process of preparing benzyl resorcinol. 22,090. September 19. (United States, September 19, 1923.)

Kennedy, A. M., and Lloyd, S. J. Methods of making arsenical salts. 21,764. September 15.

Naugatuck Chemical Co. Manufacture of styrol, etc. 21,751. September 15. (United States, May 7.)

Naugatuck Chemical Co. Manufacture of styrol, etc. 21,755. September 14. (United States, April 24.)

Preiss, P. Method of removing phenol, etc., from waste waters, etc. 22,132. September 19.

Roos, W. C. Centrifugal separators. 22,203. September 20. (Dutch East Indies, September 20, 1923.)

Spence and Sons, Ltd., P. Treatment of aluminous materials. 22,018. September 18.

Synthetic Ammonia and Nitrates, Ltd. Synthetic ammonia process. 22,091. September 19. (United States, September 19, 1923.)

Thies, B. K. Dyeing-apparatus. 22,072. September 18.

London Chemical Market

The following notes on the London Chemical Market are specially supplied to THE CHEMICAL AGE by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., and may be accepted as representing those firms' independent and impartial opinions.

London, September 24, 1924.

BUSINESS has been uneventful during the current week and demand still keeps on about the same level. Much more business could be accommodated, and there are evidences in one or two directions of a slowly broadening tendency. There are some slight price changes which are mainly in the downward direction. Export business is quiet although the demand has broadened from one or two markets.

General Chemicals

ACETONE.—Demand has slightly improved and price is standing at about £93 to £95 per ton. This figure is below that ruling in most other countries, and an advance in price is considered to be not unlikely.

ACID ACETIC continues quiet, technical is quoted at £44 and pure 80% at £45, with a somewhat easy tendency.

ACID CITRIC continues slow and price nominally 1s. 3d. to 1s. 3¼d. per lb.

ACID FORMIC is unchanged and in fair demand at £53 to £54 per ton for 85%.

ACID LACTIC.—The demand seems to have improved slightly and the value is unchanged at £43 per ton for 50% by weight.

ACID TARTARIC is depressed and in buyers' favour, value nominally about 11½d. to 1s. per lb.

ALUMINA SULPHATE.—Price continues very easy owing to extreme competition on the part of Continental makers, 17/18% is quoted at from £7 5s. to £7 10s. per ton.

ARSENIC remains quiet at about £45 to £47 per ton; export inquiry is practically absent, although it is expected to revive shortly when an improvement in price may be looked for.

BARIUM CHLORIDE price is standing at £14 per ton, although the demand has not been as good as of late.

COPPER SULPHATE.—Demand continues small and quotation is nominally about £23 per ton, Continental makers are firmer in their ideas of price.

CREAM OF TARTAR is in small demand and is quoted at about 80s. per cwt. less 2½%.

FORMALDEHYDE, although slow of sale, is standing at about £52 to £53 per ton.

LEAD ACETATE is strong and firm at £46 to £47 per ton.

LEAD NITRATE.—Demand is only small but the market is well maintained at £43 per ton.

LIME ACETATE is again lower and business can be done at about £16 to £16 10s. per ton.

METHYL ALCOHOL seems to be slightly firmer and the demand is better, the price to-day is about £62 per ton.

POTASSIUM CARBONATE AND CAUSTIC remain quiet and are unchanged in value.

POTASSIUM PERMANGANATE seems to be somewhat steadier although the demand leaves a lot to be desired, price is 7¼d. per lb.

POTASSIUM PRUSSIATE would seem to be firmer and there has been a much better volume of business, quotations vary between 7¼d. and 7½d. per lb.

SODIUM ACETATE is easier and is now quoted at £21 10s. to £23 per ton according to quantity and position.

SODIUM HYPOSULPHITE is in fair demand and is standing at £9 10s. to £9 15s. for commercial quality.

SODIUM NITRITE has been fairly active and is standing at about £25 per ton.

SODIUM PRUSSIATE.—The improvement in demand continues, and the outlook is now better than it has been for some time, price is standing at 4½d. per lb.

SODIUM SULPHIDE is in normal request at £14 per ton for concentrated.

Coal Tar Products

There is no change to report in the market for coal tar products from last week.

90% BENZOL remains unchanged at 1s. 5½d. to 1s. 6d. per gallon on rails.

PURE BENZOL is quoted at 1s. 9d. to 1s. 10d. per gallon on rails.

CREOSOTE OIL is steady at 5¼d. to 5½d. per gallon on rails in the North, and 6d. to 6¼d. per gallon in London.

CRESYLIC ACID is quoted at 1s. 11d. to 2s. per gallon on rails for the Pale quality 97/99%, and 1s. 8½d. to 1s. 9d. per gallon on rails at works for the Dark quality 95/97%.

SOLVENT NAPHTHA remains unchanged at 11d. to 11½d. per gallon on rails.

HEAVY NAPHTHA is also unchanged at 10d. to 11d. per gallon.

NAPHTHALENES are still in very poor demand, while quite considerable supplies are available. There is no change to report in the prices. Low grades are quoted from £3 10s. to £4 per ton on rails, while the higher grades 76/78 are worth from £6 10s. to £7 per ton, and 74/76 quality £5 10s. to £6 per ton.

PITCH remains dull, and prices still have a downward tendency. To-day's values are:—London, 45s. to 50s. per ton; East Coast, 45s. to 47s. 6d. per ton; West Coast, 42s. 6d. to 45s. per ton.

SULPHATE OF AMMONIA is unchanged. Export demand is satisfactory, and prices are maintained.

Nitrogen Products Market

THERE has been practically no change in the position since last week's report.

Prices for export to the Colonies are £13 10s. for prompt and £14 to £14 10s. per ton for forward.

The home agricultural price for October is 2s. per ton above that for September, viz., £14 4s. per ton in four-ton lots for neutral quality, but as is usual at this time of the year the home demand is quiet.

The nitrate of soda market is distinctly firmer. Prompt prices being £11 10s. to £11 12s. per ton c.i.f. and forward £12 3s. 6d. per ton.

Determination of Sodium in Aluminium

IN a paper on "The Determination of Sodium in Aluminium," by Messrs. D. M. Fairlie, M.Sc., and G. B. Brook, F.I.C., presented at the annual autumn meeting of the Institute of Metals, in London on Wednesday, a process was described in detail for separating sodium from aluminium which, while possessing reasonable accuracy, can be carried out by the average laboratory assistant. The difficulty of the process will be realised when it is stated that sodium has always appeared among the constituents specified by Government Departments as not allowable in aluminium beyond a trace (0·05 per cent., afterwards reduced to 0·03 per cent.). The accuracy of the process is much greater than that yielded by the majority of analytical methods, particularly in view of the fact that the sodium is probably in suspension, and not in solution, in the aluminium. With high purity samples of aluminium, showing a sodium content of 0·008 per cent., the result of many analyses shows a mean error not exceeding 0·001.

Removal of Sulphur from Ceramic Wares

UNDER a general investigation into the oxidation of ceramic wares during firing, being conducted at the Columbus, Ohio, Experiment Station of the U.S.A. Bureau of Mines, a study has been undertaken on a semi-commercial scale to test methods that have been developed in a laboratory way for the more rapid removal of sulphur from ceramic wares during firing. Several shales and fire clays have been chemically and microscopically tested for suitability in the work and a procedure has been worked out for a series of semi-commercial burns. A ton of a North Columbus shale which is particularly difficult to oxidise has been obtained and a number of standard bricks made up. They will be fired in lots of fifty each. Preparations are complete for making the required measurements during the firing and of so controlling and varying the temperature and atmosphere as to get the results desired. It is intended to fire the kiln in forty-eight hours on a compressed schedule adopted from a commercial kiln recently tested.

Weekly Prices of British Chemical Products

The prices and comments given below respecting British chemical products are based on direct information supplied by the British manufacturers concerned. Unless otherwise qualified, the figures quoted apply to fair quantities, net and naked at sellers' works.

General Heavy Chemicals

Acid Acetic 40% Tech.—£23 10s. per ton.

Acid Boric, Commercial.—Crystal, £45 per ton. Powder, £47 per ton

Acid Hydrochloric.—3s. 9d. to 6s. per carboy d/d., according to purity, strength and locality.

Acid Nitric 80° Tw.—£21 10s. to £27 per ton, makers' works according to district and quality.

Acid Sulphuric.—Average National prices f.o.r. makers' works, with slight variations up and down owing to local considerations: 140° Tw., Crude Acid, 65s. per ton. 168° Tw., Arsenical, £5 10s. per ton. 168° Tw., Non-arsenical, £6 15s. per ton.

Ammonia Alkali.—£6 15s. per ton f.o.r. Special terms for contracts.

Bleaching Powder.—Spot, £11 d/d.; Contract, £10 d/d. 4 ton lots.

Bisulphite of Lime.—£7 per ton, packages extra.

Borax, Commercial.—Crystal, £25 per ton. Powder, £26 per ton. (Packed in 2-cwt. bags, carriage paid any station in Great Britain.)

Calcium Chloride.—£5 17s. 6d. per ton d/d.

Copper Sulphate.—£25 per ton.

Methylated Spirit 64 O.P.—Industrial, 2s. 7d. to 2s. 11d. per gall. Mineralised, 3s. 8d. to 4s. per gall., in each case according to quantity.

Nickel Sulphate.—£38 per ton d/d. Normal business.

Nickel Ammonia Sulphate.—£38 per ton d/d. Normal business

Potash Caustic.—£30 to £33 per ton.

Potassium Bichromate.—5½d. per lb.

Potassium Chlorate.—3d. to 4d. per lb.

Salammoniac.—£32 per ton d/d.

Salt Cake.—£3 10s. per ton d/d.

Soda Caustic, Solid.—Spot lots delivered, £16 7s. 6d. to £19 7s. 6d. per ton, according to strength; 20s. less for contracts.

Soda Crystals.—£5 5s. to £5 10s. per ton ex railway depots or ports.

Sodium Acetate 97/98%.—£24 per ton.

Sodium Bicarbonate.—£10 10s. per ton carr. paid.

Sodium Bichromate.—4½d. per lb.

Sodium Bisulphite Powder 60/62%.—£18 to £19 per ton according to quantity, f.o.b., 1-cwt. iron drums included.

Sodium Chlorate.—3d. per lb.

Sodium Nitrate refined 96%.—£13 5s. to £13 10s. per ton, ex Liverpool. Nominal.

Sodium Nitrite 100% basis.—£27 per ton d/d.

Sodium Sulphide conc. 60/65.—About £14 10s. per ton d/d.

Sodium Sulphide Crystals.—£9 per ton d/d.

Sodium Sulphite, Pea Crystals.—£15 per ton f.o.r. London, 1-cwt. kegs included.

Coal Tar Products

Acid Carbolic Crystals.—6½d. per lb. Quiet. Crude 60's, 1s. 7d. to 1s. 11d. per gall.

Acid Cresylic 97/99.—2s. to 2s. 1d. per gall. Demand fair. Pale 95%, 1s. 9d. to 2s. 1d. per gall. Not much inquiry. Dark, 1s. 9d. to 1s. 11d. per gall. Quiet.

Anthracene Paste 40%.—4d. per unit per cwt. Nominal price. No business.

Anthracene Oil, Strained.—6½d. to 7½d. per gall. Quiet. Unstrained, 7d. to 7½d. per gall.

Benzol.—Crude 65's.—7½d. to 9d. per gall., ex works in tank wagons. Standard Motor, 1s. 1½d. to 1s. 3d. per gall., ex works in tank wagons. Pure, 1s. 5½d. to 1s. 7d. per gall., ex works in tank wagons.

Toluol.—90%, 1s. 5d. to 1s. 5½d. per gall. Pure, 1s. 8d. to 2s. per gall.

Xylol Commercial.—2s. 3d. per gall. Pure, 3s. 3d. per gall.

Creosote.—Cresylic, 20/24%, 8½d. per gall. Better demand. Middle Oil, Heavy, Standard specification, 5½d. to 6d. per gall., according to quality and district. Small export inquiry. Fair demand.

Naphtha.—Crude, 8d. to 9d. per gall. Solvent 90/160, 11d. to 1s. 2d. per gall., according to district. Steady market. Solvent 90/190, 11d. to 1s. per gall. Not much demand.

Naphthalene Crude.—Market dull. Cheaper in Yorkshire than in Lancashire. Drained Creosote Salts, £4 to £6 per ton. Quiet. Whizzed or hot pressed, £7 to £9 per ton.

Naphthalene.—Crystals and Flaked, £12 to £13 per ton.

Pitch.—Medium soft, 55s. to 60s. per ton, f.a.s. for next season. Frequent inquiries.

Pyridine.—90/160, 19s. per gall. Steady demand. Heavy, 12s. Little business.

Intermediates and Dyes

There has been some slight improvement in the business passing for Aniline Dyes.

In the following list of Intermediates delivered prices include packages except where otherwise stated.

Acetic Anhydride 95%.—1s. 7d. per lb.

Acid H.—3s. 11d. per lb. 100% basis d/d.

Acid Naphthionic.—2s. 4d. per lb. 100% basis d/d.

Acid Neville and Winther.—5s. 8d. per lb. 100% basis d/d.

Acid Salicylic, technical.—1s. 1d. per lb. Improved demand.

Acid Sulphanilic.—9½d. per lb. 100% basis d/d.

Aluminium Chloride, anhydrous.—1s. per lb. d/d.

Aniline Oil.—8d. per lb. naked at works.

Aniline Salts.—8½d. per lb. naked at works.

Antimony Pentachloride.—1s. per lb. d/d.

Benzidine Base.—4s. per lb. 100% basis d/d.

Benzyl Chloride 95%.—1s. 1d. per lb.

***p*-Chlorphenol.**—4s. 3d. per lb. d/d.

***p*-Chloraniline.**—3s. per lb. 100% basis.

***o*-Cresol 19/31° C.**—4½d. per lb. Rather quiet.

***m*-Cresol 98/100%.**—2s. 1d. to 2s. 3d. per lb. Demand moderate.

***p*-Cresol 32/34° C.**—2s. 1d. to 2s. 3d. per lb. Demand moderate.

Dichloraniline.—2s. 3d. to 3s. per lb.

Dichloraniline S. Acid.—2s. 6d. per lb. 100% basis.

***p*-Dichlorbenzol.**—£85 per ton.

Diethylaniline.—4s. 6d. per lb. d/d., packages extra, returnable.

Dimethyaniline.—2s. 3d. per lb. d/d. Drums extra.

Dinitrobenzene.—9d. to 10d. per lb. naked at works.

Dinitrochlorbenzol.—£84 10s. per ton d/d.

Dinitrotoluene.—48/50° C. 8d. to 9d. per lb. naked at works. 66/68° C. 1s. 2d. per lb. naked at works.

Diphenylaniline.—2s. 10d. per lb. d/d.

Monochlorbenzol.—£63 per ton.

***B*-Naphthol.**—1s. per lb. d/d.

***a*-Naphthylamine.**—1s. 4d. per lb. d/d.

***B*-Naphthylamine.**—4s. per lb. d/d.

***m*-Nitraniline.**—4s. 3d. per lb. d/d.

***p*-Nitraniline.**—2s. 3d. per lb. d/d.

Nitrobenzene.—5½d. to 5¾d. per lb. naked at works.

***o*-Nitrochlorbenzol.**—2s. per lb. 100% basis d/d.

Nitronapthalene.—10½d. per lb. d/d.

***p*-Nitrophenol.**—1s. 9d. per lb. 100 % basis d/d.

***p*-Nitro-*o*-amido-phenol.**—4s. 6d. per lb. 100% basis.

***m*-Phenylene Diamine.**—3s. 11d. per lb. d/d.

***p*-Phenylene Diamine.**—10s. 2d. per lb. 100% basis d/d.

R. Salt.—2s. 5d. per lb. 100% basis d/d.

Sodium Naphthionate.—2s. 3d. per lb. 100% basis d/d.

***o*-Toluidine.**—8½d. per lb.

***p*-Toluidine.**—3s. 3d. to 4s. 2d. per lb. naked at works.

***m*-Toluylene Diamine.**—4s. per lb. d/d.

Wood Distillation Products

Acetate of Lime.—Brown £12 per ton d/d. Grey £16 per ton. Market easier. Liquor, 9d. per gall. 32° Tw.

Charcoal.—£7 15s. to £9 5s. per ton, according to grade and locality. Market brisker.

Iron Liquor.—1s. 7d. per gall. 32° Tw. 1s. 2d. per gall. 24° Tw.

Red Liquor.—10d. to 1s. per gall. 14/15° Tw.

Wood Creosote.—2s. 9d. per gall. Unrefined.

Wood Naphtha, Miscible.—4s. 10d. per gall. 60% O.P. Market dull. Solvent, 5s. 3d. per gall. 40% O.P. Fairly good demand.

Wood Tar.—£4 5s. per ton. Cheaper.

Brown Sugar of Lead.—£43 per ton. Cheaper.

Rubber Chemicals

Antimony Sulphide.—Golden, 5½d. to 1s. 4d. per lb., according to quality. Crimson, 1s. 3d. to 1s. 6d. per lb., according to quality.

Arsenic Sulphide, Yellow.—1s. 11d. per lb.

Barytes.—£3 10s. to £6 15s. per ton, according to quality.

Cadmium Sulphide.—3s. 9d. to 4s. per lb., according to quantity.

Carbon Bisulphide.—£30 to £33 per ton, according to quantity. Again dearer.

Carbon Black.—7d. to 7½d. per lb., ex-wharf. Dearer.

Carbon Tetrachloride.—£60 to £65 per ton, according to quantity, drums extra. Again dearer.

Chromium Oxide, Green.—1s. 3d. per lb.

Indiarubber Substitutes, White and Dark.—5d. to 9½d. per lb. Demand very brisk. Prices likely to remain steady owing to firmness of rapeseed oils.

Lamp Black.—£48 per ton, barrels free.

Lead Hyposulphite.—7½d. per lb.

Lithopone, 30%.—£22 10s. per ton.

Mineral Rubber "Rubpron."—£16 5s. per ton f.o.r. London.

Sulphur.—£10 to £12 per ton, according to quality.
Sulphur Chloride.—4d. per lb., carboys extra. Dearer.
Thiocarbanilide.—2s. 6d. per lb.
Vermilion, Pale or Deep.—5s. 1d. per lb. Dearer.
Zinc Sulphide.—7½d. to 1s. 8d. per lb., according to quality.

Pharmaceutical and Photographic Chemicals

Acid, Acetic 80% B.P.—£45 per ton.
Acid, Acetyl Salicylic.—3s. to 3s. 3d. according to quality.
Acid, Benzoic B.P.—3s. to 3s. 6d. per lb.
Acid, Boric B.P.—Crystal £51 per ton, Powder £55 per ton. Carriage paid any station in Great Britain.
Acid, Camphoric.—19s. to 21s. per lb.
Acid, Citric.—1s. 4½d. to 1s. 5d. per lb., less 5% for ton lots. Market very weak.
Acid, Gallic.—3s. per lb. for pure crystal.
Acid, Pyrogallic, Crystals.—6s. 9d. per lb. for 1 cwt. lots. Market firm. Increasing demand.
Acid, Salicylic.—1s. 5d. to 1s. 8d. per lb. According to quantity.
Acid, Tannic B.P.—2s. 10d. per lb. Market quiet.
Acid, Tartaric.—1s. 1¼d. per lb., less 5%.
Amidol.—9s. per lb. d/d.
Acetanilide.—2s. 1d. to 2s. 3d. per lb. for quantity. Demand slow.
Amidopyrin.—13s. 3d. per lb. Neglected. Stocks low.
Ammonium Benzoate.—3s.3d. to 3s.6d. per lb. according to quantity.
Ammonium Carbonate B.P.—£37 per ton.
Atropine Sulphate.—12s. 6d. per oz. for English make.
Barbitone.—15s. to 15s. 6d. per lb. Quiet market.
Benzonaphthol.—5s. 3d. per lb. Small inquiry.
Bismuth Salts.—Prices reduced by about 1s. 3d. to 2s. 3d. per lb. on account of the fall in the price of the metal.
Bismuth Carbonate.—10s. 6d. to 12s. 6d. per lb.
Bismuth Citrate.—10s. 3d. to 12s. 3d. per lb.
Bismuth Salicylate.—9s. 0d. to 11s. 0d. per lb.
Bismuth Subnitrate.—9s. 8d. to 10s. 8d. per lb.
Borax B.P.—Crystal £29, Powder £30 per ton. Carriage paid any station in Great Britain.
Bromides.—Potassium, 1s. 4d. to 1s. 7d. per lb.; sodium, 1s. 5d. to 1s. 8d. per lb.; ammonium, 1s. 6d. to 1s. 9d. per lb. Market firm and Continental prices fully maintained with upward tendency.
Calcium Lactate—1s. 5d. to 1s. 9d. according to quantity. Fair demand and steady market.
Chloral Hydrate.—4s. to 4s. 3d. per lb. Very firm and scarce.
Chloroform.—2s. per lb. for cwt. lots. Very steady.
Creosote Carbonate.—6s. 6d. per lb. Little demand.
Formaldehyde.—£59 per ton, ex works. English make in casks. About 8s. per cwt. extra for carboys.
Glycerophosphates.—Fair business passing. Calcium, soluble and citrate free, 7s. per lb.; iron, 8s. 9d. per lb.; magnesium, 9s. per lb.; potassium, 50%, 3s. 6d. per lb.; sodium, 50%, 2s. 6d. per lb.
Guaiacol Carbonate.—10s. 6d. to 11s. 3d. per lb.
Hexamine.—3s. 1d. per lb. and upward. Market weak.
Homatropine Hydrobromide.—30s. per oz.
Hydrastine Hydrochloride.—English make offered at 120s. per oz.
Hydroquinone.—4s. 3d. per lb. in cwt. lots. Foreign make.
Hypophosphites.—Calcium, 3s. 6d. per lb. for 28 lb. lots; potassium, 4s. 1d. per lb.; sodium, 4s. per lb.
Iron Ammonium Citrate B.P.—2s. 1d. to 2s. 5d. per lb., according to quantity.
Magnesium Carbonate.—Light Commercial, £36 per ton net.
Magnesium Oxide.—Light Commercial, £75 per ton, less 2½%; Heavy Commercial, £25 per ton, less 2½%; Heavy Pure, 1s. 6d. to 2s. per lb., according to quantity. Steady market.
Menthol.—A.B.R. recrystallised B.P., 56s. per lb. Synthetic, 26s. to 31s. per lb., according to quantity. English make.
Mercurials.—Market very quiet. Red oxide, 5s. 3d. to 5s. 4d. per lb.; Corrosive sublimate, 3s. 6d. to 3s. 7d. per lb.; white precipitate, 4s. 7d. to 4s. 8d. per lb.; Calomel, 3s. 11d. to 4s. per lb.
Methyl Salicylate.—1s. 9d. to 1s. 10d. per lb. Market has weakened.
Methyl Sulphonel.—26s. per lb.
Metol.—11s. per lb. British make.
Morphine and Salts.—Reduced by 1s. to 1s. 3d. per oz.
Paraformaldehyde.—2s. 10½d. to 3s. per lb. Not very active.
Paraldehyde.—1s. 6d. per lb. in free bottles and cases.
Phenacetin.—5s. 9d. per lb.
Phenazone.—7s. 2d.
Phenolphthalein.—5s. 7d. per lb. in cwt. lots.
Potassium Bitartrate 99/100% (Cream of Tartar).—88s. per cwt. less 2½% for ton lots. Firm market. Prices have upward tendency.
Potassium Citrate.—1s. 10d. to 2s. 2d. per lb. Dearer.
Potassium Iodide.—16s. 8d. to 17s. 5d. per lb., according to quantity. Good steady demand.
Potassium Metabisulphite.—7½d. per lb., 1-cwt. kegs included, f.o.r. London.
Potassium Permanganate.—B.P. crystals, 7½d. per lb., carriage paid; commercial, 8d. to 8½d. per lb., carriage paid. Keen competition keeps prices low.
Quinine Sulphate.—2s.3d. to 2s. 4d. per oz., in 100 oz. tins. Good market.
Resorcin.—5s. 6d. per lb.
Saccharin.—63s. per lb. in 50-lb. lots.
Salol.—3s. 6d. per lb.
Silver Proteinate.—9s. 6d. per lb.
Sodium Benzoate, B.P.—2s. 9d. per lb. Ample supplies B.P. quality available.
Sodium Citrate, B.P.C., 1923.—1s. 11d. to 2s. 2d. per lb., according to quantity.
Sodium Hypophosphite, Photographic.—£13 to £15 per ton, according to quantity, d/d. consignee's station in 1-cwt. kegs.
Sodium Metabisulphite Crystals.—37s. 6d. to 60s. per cwt., net cash, according to quantity.
Sodium Nitroprusside.—16s. per lb. Less for quantity.
Sodium Potassium Tartrate (Rochelle Salt).—75s. to 82s. 6d. per cwt., according to quantity. Market steady, good demand.
Sodium Salicylate.—Powder, 2s. to 2s. 3d. per lb. Crystal, 2s. 3d. to 2s. 5d. per lb. Flake, 2s. 9d. per lb. Market rather easier.
Sodium Sulphide, pure recrystallised.—10d. to 1s. 2d. per lb., according to quantity.
Sodium Sulphite, anhydrous, £27 10s. to £28 10s. per ton, according to quantity, 1 cwt. kegs included. In large casks £1 per ton less.
Sulphonal.—15s. per lb. Easier.
Thymol.—17s. 6d. per lb. Very scarce indeed.

Perfumery Chemicals

Acetophenone.—12s. 6d. per lb.
Aubepine.—15s. 3d. per lb. Advanced.
Amyl Acetate.—2s. 6d. per lb. Cheaper.
Amyl Butyrate.—6s. 9d. per lb.
Amyl Salicylate.—3s. per lb.
Anethol (M.P. 21/22° C.).—4s. 6d. per lb.
Benzyl Acetate from Chlorine-free Benzyl Alcohol.—2s. 9d. per lb.
Benzyl Alcohol free from Chlorine.—2s. 9d. per lb.
Benzaldehyde free from Chlorine.—3s. 6d. per lb.
Benzyl Benzoate.—3s. 6d. per lb.
Cinnamic Aldehyde Natural.—18s. 9d. per lb. Advanced.
Coumarin.—19s. 6d. per lb. Cheaper.
Citronellol.—17s. per lb. Again advanced.
Citral.—8s. 6d. per lb. Cheaper. Price reduction due to selling competition.
Ethyl Cinnamate.—12s. 6d. per lb. Cheaper.
Ethyl Phthalate.—3s. 3d. per lb.
Eugenol.—10s. 6d. per lb. Cheaper.
Geraniol (Palmarosa).—35s. per lb.
Geraniol.—11s. to 18s. 6d. per lb.
Heliotropine.—6s. 9d. per lb. Cheaper.
Iso Eugenol.—15s. 9d. per lb.
Linalol ex Bois de Rose.—26s. per lb.
Linalyl Acetate.—26s. per lb.
Methyl Anthranilate.—9s. 6d. per lb.
Methyl Benzoate.—5s. per lb.
Musk Ambrette.—45s. per lb. Cheaper.
Musk Xylol.—13s. 6d. per lb. Again cheaper.
Nerolin.—4s. 9d. per lb. Advanced.
Phenyl Ethyl Acetate.—15s. per lb. Advanced.
Phenyl Ethyl Alcohol.—16s. per lb.
Rhodinol.—60s. per lb. Advanced.
Safrol.—1s. 10d. per lb.
Terpineol.—2s. 4d. per lb. Cheaper.
Vanillin.—26s. per lb.

Essential Oils

Almond Oil, Foreign S.P.A.—15s. 6d. per lb.
Anise Oil.—2s. 8d. per lb.
Bergamot Oil.—17s. 6d. per lb. Again firmer.
Bourbon Geranium Oil.—36s. per lb.
Camphor Oil.—65s. per cwt.
Cananga Oil, Java.—10s. 6d. per lb.
Cinnamon Oil, Leaf.—6½d. per oz.
Cassia Oil, 80/85%.—10s. per lb. Advanced.
Citronella Oil.—Java, 85/90%, 5s. 9d. per lb. Ceylon, 3s. 7d. per lb.
Clove Oil.—7s. 6d. per lb. Cheaper.
Eucalyptus Oil, 70/75%.—2s. 3d. per lb. Cheaper.
Lavender Oil.—French 38/40% Esters, 27s. 6d. per lb. Cheaper.
Lemon Oil.—3s. per lb.
Lemongrass Oil.—4s. 6d. per lb.
Orange Oil, Sweet.—11s. per lb.
Otto of Rose Oil.—Bulgarian, 37s. 6d. per oz. Production below normal. Anatolian, 18s. per oz.
Palma Rosa Oil.—16s. 6d. per lb. Cheaper.
Peppermint Oil.—Wayne County, 30s. per lb. Firm spot and forward. Japanese, 18s. 6d. per lb. Market very active and prices rising.
Petitgrain Oil.—9s. 3d. per lb.
Sandal Wood Oil.—Mysore, 26s. 7d. per lb. Australian, 21s. per lb.

Scottish Chemical Market

The following notes on the Scottish Chemical Market are specially supplied to* THE CHEMICAL AGE *by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing the firm's independent and impartial opinions.

Glasgow, September 24, 1924.

BUSINESS in the heavy chemical trade market has been rather better during the past week, there being quite a number of inquiries both for home and export. There is no change of importance to record.

Industrial Chemicals

ACID ACETIC.—Glacial, 98/100%, £58/£69 per ton; 80% pure, £45/£46 per ton; 80 % technical, £44/£45 per ton. All packed in casks delivered c.i.f. U.K. ports, duty free.

ACID BORACIC.—Crystal or granulated, £45 per ton; powdered, £47 per ton, carriage paid U.K. stations, minimum ton lots.

ACID CARBOLIC, ICE CRYSTALS.—Still further reduced, now quoted 6d. per lb. delivered, or f.o.b. U.K. port.

ACID CITRIC, B.P. CRYSTALS.—Unchanged at 1s. 4d. per lb., less 5%, ex store.

ACID FORMIC, 85%.—Spot lots quoted £55 10s. per ton, ex store; on offer from the continent at about £53 per ton, ex wharf.

ACID HYDROCHLORIC.—In little demand. Price, 6s. 6d. per carboy, ex works.

ACID NITRIC, 80°.—£23 10s. per ton, ex station, full truck loads.

ACID OXALIC, 98/100%.—Quoted 4d. per lb., ex station, prompt delivery. Offered for early delivery at about ¼d. per lb. less.

ACID SULPHURIC, 144°.—£3 12s. 6d. per ton; 108°, £7 per ton, ex works; full truck loads. Dearsenicated quality, 20s. per ton more.

ACID TARTARIC, B.P. CRYSTALS.—Unchanged at about 1s. per lb. less 5%, ex store.

ALUMINA SULPHATE, 17/18% IRON FREE.—Unchanged at about £8 per ton, ex store. Quoted £7 5s. per ton, c.i.f. U.K. port, prompt shipment.

ALUM.—Ammonium chrome alum on offer at £17 to £18 per ton, according to quality, f.o.b. U.K. port for export. Lump potash alum quoted £9 12s. 6d. per ton, ex store, spot delivery. Offered for prompt shipment from the continent at about £8 7s. 6d. per ton ci.f. U.K. port.

AMMONIA ANHYDROUS.—Unchanged at about 1s. 6d. per lb., ex station. Containers extra and returnable.

AMMONIA CARBONATE.—Lump, £37 per ton; powdered, £39 per ton, packed in 5 cwt. casks delivered U.K. port.

AMMONIA LIQUID, 880°.—In steady demand. Unchanged at 2½d. to 3d. per lb. delivered, according to quantity; containers extra.

AMMONIA MURIATE.—Grey galvaniser's crystals of English manufacture quoted £30 per ton, ex station. Offered from the continent at about £26 10s. per ton, c.i.f. U.K. port. Fine white crystals offered from the continent at £24 12s. 6d. per ton, c.i.f. U.K. port.

ARSENIC, WHITE POWDERED.—Spot lots quoted £51 per ton, ex store. Moderate inquiry for export and price about £47 per ton, f.o.b. U.K. port.

BARIUM CARBONATE, 98/100%.—Powdered, now on offer from the continent at about £9 10s. per ton delivered c.i.f. U.K. port.

BARIUM CHLORIDE, 98/100%.—Spot material unchanged at about £14 per ton, ex store. On offer from the continent at about £12 10s. per ton, c.i.f. U.K. port.

BARYTES.—English material unchanged at £5 5s. per ton, ex works. Continental quoted £5 per ton, c.i.f. U.K. port.

BLEACHING POWDER.—Spot lots £11 per ton, ex station. Contracts 20s. per ton less.

BORAX.—Granulated, £24 10s. per ton; crystals, £25 per ton; powdered, £26 per ton, carriage paid U.K. stations, minimum ton lots.

CALCIUM CHLORIDE.—English material unchanged at £5 12s. 6d. per ton, ex station. Continental slightly cheaper, now quoted £4 15s. per ton, c.i.f. U.K. port.

COPPERAS, GREEN.—Unchanged at about £3 per ton, ex works, packed in casks, free.

COPPER SULPHATE.—Moderate inquiry for export. Now quoted £24 5s. per ton, f.o.b. U.K. port. Continental material on offer at about £23 5s. per ton, ex quay.

FORMALDEHYDE, 40%.—Spot lots unchanged at £53 10s. per ton, ex store. Offered for prompt shipment from America at £50 per ton, c.i.f. U.K. port.

GLAUBER SALTS.—English material quoted £4 per ton, ex store or station. Fine white crystals offered from the continent at £3 5s. per ton, c.i.f. U.K. port. Large crystals 10s. per ton extra.

LEAD, RED.—Imported material quoted £41 10s. per ton, ex store, spot delivery.

LEAD, WHITE.—On offer at £44 5s. per ton, ex store, spot delivery.

LEAD ACETATE.—Brown crystals on offer from the continent at £39 5s. per ton, c.i.f. U.K. port; refined white crystals quoted £45 10s. per ton, ex store, spot delivery.

MAGNESITE, CALCINED.—Unchanged at about £7 17s. 6d. per ton, ex station, prompt delivery. Hard burnt quality quoted £4 15s. per ton, ex station. Finer quality of continental manufacture quoted £7 15s. per ton, c.i.f. U.K. port.

MAGNESIUM CHLORIDE.—Slightly cheaper quotations from the continent. Now quoted £3 19s. per ton, c.i.f. U.K. port. Spot lots available at £4 5s. per ton, ex store.

POTASH CAUSTIC, 88/92%.—Spot lots on offer at about £30 per ton, ex store. Quoted £28 15s. per ton c.i.f. U.K. port. Prompt shipment from the continent.

POTASSIUM BICHROMATE.—Unchanged at 5½d. per lb., delivered.

POTASSIUM CARBONATE, 96/98%.—Offered from the continent at £22 7s. 6d. per ton, c.i.f. U.K. port. Spot lots quoted £24 15s. per ton, ex store. 90/94% quality quoted £20 10s. per ton, c.i.f. U.K. port.

POTASSIUM CHLORATE.—Offered for prompt shipment from the continent at about 2¾d. per lb., ex wharf, spot lots quoted 3d. per lb., ex store.

POTASSIUM NITRATE (SALTPETRE).—Quoted £26 per ton c.i.f. U.K. port, prompt shipment from the continent. Spot lots on offer at £28 15s. per ton, ex store.

POTASSIUM PERMANGANATE, B.P. CRYSTALS.—Quoted 6d. per lb., ex wharf, prompt shipment from the continent. Spot lots available at about 8d. per lb. ex store.

POTASSIUM PRUSSIATE, YELLOW.—Still in little demand. Quoted 7d. per lb., ex store.

SODA CAUSTIC.—76/77%, £19 7s. 6d. per ton; 70/72%, £17 17s. 6d. per ton; 60/62%, broken, £19 2s. 6d.; 98/99%, powdered, £22 15s. per ton; all ex station, spot delivery. Contracts 20s. per ton less.

SODIUM ACETATE.—Spot lots unchanged at about £23 5s. per ton, ex store. Quoted £22 10s. per ton, ex wharf. Prompt shipment from the continent.

SODIUM BICARBONATE.—Refined recrystallised quality, £10 10s. per ton, ex quay or station; M.W. quality, 30s. per ton less.

SODIUM BICHROMATE.—Unchanged at 4¼d. per lb. delivered.

SODIUM CARBONATE, SODA CRYSTALS.—£5 per ton to £5 5s. per ton, ex quay or station. Alkali 58%, £8 12s. 3d. per ton, ex quay or station.

SODIUM HYPOSULPHITE.—English material unchanged at £10 per ton, ex station. Continental on offer at about £9 7s. 6d. per ton, ex store. Quoted £8 5s. per ton c.i.f. U.K. ports. Prompt shipment from the continent. Pea crystals of English manufacture unchanged at £13 15s. per ton ex station.

SODIUM NITRATE.—Ordinary quality unchanged at £13 10s. per ton ex store. 96/98% refined quality, 7s. 6d. per ton extra.

SODIUM NITRITE, 100%.—In little demand. Spot material quoted £26 5s. per ton, ex store.

SODIUM PRUSSIATE, YELLOW.—In little demand. Quoted 4d. per lb., ex station or f.o.b. U.K. port.

SODIUM SULPHATE, SALTCAKE.—Price for home consumption £3 10s. per ton, carriage paid buyers' station. Good inquiry for export and price about £3 per ton f.o.b. U.K. port.

SODIUM SULPHIDE.—60/65%, solid, of English manufacture, £14 15s. per ton, ex station; broken, £1 per ton more; flake, £2 per ton more; 60/62%, solid, offered from the continent at £12 10s. per ton c.i.f. U.K. port; broken, £1 2s. 6d. per ton extra; 31/34%, crystals of English manufacture, £9 2s. 6d. per ton, ex station; 30/32%, crystals offered from the continent at £8 12s. 6d. per ton c.i.f. U.K. port.

SULPHUR.—Flowers, £9 10s. per ton; roll, £8 10s. per ton; rock, £8 7s. 6d. per ton; ground, £8 5s. per ton; ex store, prices nominal.

ZINC CHLORIDE.—98/100%, solid, offered from the continent at about £24 5s. per ton c.i.f. U.K. port; 96/98 %, quoted £23 10s. per ton c.i.f. U.K. port; English material for export about £26 per ton f.o.b. U.K. port.

ZINC SULPHATE.—Spot lots of continental material available at £11 10s. per ton, ex wharf.

NOTE.—The above prices are for bulk business, and are not to be taken as applicable for small parcels.

Coal Tar Intermediates and Wood Distillation Products

ALPHA NAPHTHOL.—Home inquiry. Price 2s. 3d. per lb. delivered.

ALPHA NAPTHYLAMINE.—In good demand. Price 1s. 4d. per lb. delivered.

BENZIDINE BASE.—Some export inquiry. Price 3s. 10d. per lb., 100% basis f.o.b.

BETA OXYNAPTHOIC ACID.—Home and export inquiries. Price 8s. 6d. per lb. delivered or f.o.b.

DIANISIDINE BASE.—Price is lower at 14s. per lb., 100% basis.

GAMMA ACID.—Export inquiry. Price 10s. per lb., 100% basis f.o.b.

H. ACID.—Export inquiry. Price 4s. per lb. 100% basis f.o.b.

META NITRANILINE.—Some home inquiry. Price 4s. 2d. per lb. delivered.

ORTHO TOLUIDINE.—Small export inquiry. Price 7½d. per lb. f.o.b. drums included.

PARANITRANILINE.—Demand continues to be fairly good. Price 2s. 3d. per lb. delivered.

PARA TOLUIDINE.—Some export inquiry. Price 4s. 3d. per lb.

S. ACID.—12s. 1d. per lb., 100% basis f.o.b.

The Manchester Chemical Market

[From Our Own Correspondent.]

Manchester, September 25, 1924.

Business on the chemical market here continues more or less on the same lines as during recent weeks, although in some quarters a better tone is reported and a slight improvement in the volume of trade done. As before, however, forward transactions are largely conspicuous by their absence, and home trade buyers seem loth to depart from the hand-to-mouth policy which has characterised their operations for some considerable time. Export trade is confined for the most part to the Colonies and the East, Continental business being on a small scale. In certain sections of the market prices still show a distinctly weak tendency, but on the whole values are pretty well maintained at last week's level.

Heavy Chemicals

Saltcake and glauber salts are still in poor request, although in each case quotations are about unchanged at round £3 10s. per ton. Prussiate of soda is attracting a small amount of buying interest and values are steadier, to-day's price being 3⅛d. to 4d. per lb. Hyposulphite of soda is rather quiet at £14 to £14 5s. per ton for photographic crystals and about £9 10s. per ton for commercial quality. Bleaching powder is maintained at round £10 per ton, but no improvement in the amount of business done can yet be reported. Caustic soda and alkali are well held at recent rates and the demand for both from home users and also for shipment keeps up. Caustic soda values range from £16 17s. 6d. per ton for 60 per cent. material to £19 7s. 6d. for 76–77 per cent., with alkali quoted at about £6 15s. per ton. The demand for sulphide of sodium continues restricted although values are quotably unchanged at £14 10s. per ton for 60–65 per cent. concentrated solid and £9 10s. per ton for crystals. Bichromate of soda is steady and meets with a moderate inquiry at 4¼d. per lb. Soda crystals are still rather quiet at £5 5s. per ton. Chlorate of soda is in moderate request at 2½d. to 2¾d. per lb. Acetate of soda is attracting a fair amount of attention and quotations are steady at £22 to £23 per ton. Phosphate of soda is quiet but unchanged from last week at £13 10s. to £14 per ton. Bicarbonate of soda is quietly steady at £10 10s. per ton.

Caustic potash is moderately active and values show little change from last week at £28 10s. per ton for 90 per cent. material. Carbonate of potash is in much the same position, the current quotation here being about £23 per ton. Yellow prussiate of potash is maintained at 7d. per lb., business being on slightly improved lines. Chlorate of potash is quiet but steady at 2¾d. per lb. Permanganate of potash is only in small demand but values are steadier again at 6¾d. to 7½d. per lb. Bichromate of potash meets with a quietly steady demand at 5½d. per lb.

Arsenic is easy but little changed from last report at £47 per ton, Manchester, for white powdered, Cornish makes, and no improvement in the situation can be reported. Copper sulphate is just a shade more active at £24 10s. per ton f.o.b. Commercial Epsom salts are steady and in moderate demand at £4 15s. per ton, with magnesium sulphate, B.P. quality, quoted at £6 10s. Nitrate of lead is in small request at £42 per ton. Acetate of lime meets with a fair inquiry, with grey quoted at round £16 per ton and brown at £43. Acetate of lead has been pretty well maintained at £44 to £46 per ton for white and £43 for brown.

Acids and Coal Tar Products

Tartaric and citric acids are only moderately active and quotations have still an easy tendency; tartaric is offering at 1s. to 1s. 1d. per lb. and citric at about 1s. 4d. Oxalic acid is quotably unchanged at round 4d. per lb. but the demand is still poor. Acetic acid is quiet but fairly steady at £42 to £43 per ton for 80 per cent. commercial and £68 per ton for glacial.

Pitch is inactive and values are distinctly weak, current quotations being more or less nominal at round £2 12s. 6d. per ton. Solvent naphtha is selling in limited quantities at 1s. 1½d. per gallon. Naphthalenes are offering at round £16 per ton for refined qualities and from £5 per ton for crude; business, however, is still rather quiet. Carbolic acid is unchanged at about 6¼d. per lb. for crystals and 1s. 10d. per gallon for crude. Creosote oil is quiet at 5¾d. per gallon.

Hamburg Oils and Fats Market

A report from the Department of Overseas Trade states that since last week there has been some further revival of the market. Goods for prompt delivery were most sought after, but offers were scanty. Prices showed an upward tendency, especially for linseed oil, during the last few days.

The market for linseed oil has remained firm and the prices continued their upward tendency at the end of the week, but linseed oil is anyhow cheaper to-day than soya bean oil. Prompt delivery was scarce this week also.

Dutch linseed oil, spot c.i.f. Dutch florin, 54·50; Harburg, prompt D.Fl., 56·50; Dutch, September delivery D.Fl., 54·25; Dutch, September-December delivery D.Fl., 53·50.

Interest in soya bean oil has almost completely ceased owing to rapidly rising prices. The disturbances in China have not been without effect on prices. Manchurian spot, £48.

Palm Kernel Oil.—Spot remained unchanged, demand being satisfactory. British in casks, £46 10s.; German, £46 15s.

Cocoanut Oil.—Business during the last few days was brisk with prices unchanged.

Castor Oil showed little change.

Cotton Oil was quiet as before, prompt delivery U.K., £49.

Sulphur Oil was very dull. Quotations were high as before.

Sulphur Olive Oil.—Prompt c.i.f. Hamburg lire, 528.

Fatty Acids.—Demand was good. Resin rose further.

French Bauxite Developments

During 1923 and the first half of 1924 the French bauxite and aluminium industries enjoyed increasing prosperity, according to a report prepared by the United States Commercial Attaché, Paris. The aluminium concerns are now running at their capacity of manufacture, and the various companies interested in bauxite and aluminium production are confident of the continuation of conditions highly favourable to operation. An increasing interest in bauxite developments is shown by French manufacturers because of their confidence that cast cement, "Ciment fondu," will soon be produced at a price allowing its wide industrial use. In making this product bauxite is necessary, and its production will rapidly increase, if, as aluminium interests believe, its manufacture by the rotary furnace can be perfected—an accomplishment which would greatly reduce the price and put it on a basis with the current brands of cement. The new product, it is claimed, has a wide field of untility, because it remains unchanged in the presence of waters charged with acids and magnesia. A number of cement interests, therefore, have been added to the list of those anxious to acquire bauxite deposits.

The consumption of bauxite, due to the high degree of prosperity prevailing in the aluminium industry, has risen beyond all previous records. Statistics show that during the first ten months of 1923 there were mined in France 270,000 tons of bauxite. It is estimated that during the year more than 310,000 tons were taken out.

Dr. Hendrick and the Chandler Museum

The Chandler Chemical Museum, at the Columbia University, to which Dr. Ellwood Hendrick has been appointed curator, contains the raw and finished products of manufacture of most of the important industries in the world, collected over a period of 50 years. There is now included in the collection the principal dyes of America and other countries; a large ceramic collection, including earthenware, stoneware, soft and hard porcelain, glass and enamel, Bakelite and other plastics; a large collection of organic chemicals of the fatty and aromatic groups; candles, animal and vegetable oils; coal, iron and petroleum and the apparatus used in gas manufacture; corn products; sugars; soaps; rubber; colloids; timber preservatives; gelatin and glue; tanning and leather.

There are also models of bacteria yeast and molds; resins and varnishes; asphalts and other bitumens; alkaloids; disinfectants, paints and varnishes; metallic products and inorganic salts of metals and non-metals; refractories, mortars and cements; textiles; products of electro-chemical manufacture; paper and cellulose; and the finest collection in the States on the history and development of photography.

Dr. Hendrick will reclassify the various collections and write monographs on each, which will greatly facilitate the work of students in the numerous processes involved.

Company News

BROKEN HILL SOUTH.—A dividend at the rate of 1s. 6d. and a bonus of 1s. per share has been declared payable on November 14.

BRITISH PORTLAND CEMENT MANUFACTURERS, LTD.—An interim dividend has been declared on the ordinary shares at the rate of 5 per cent. actual, in respect of the year ending December 31, 1924.

EVANS, SONS, LESCHER AND WEBB.—A loss of £47,119 is reported for the year 1923, which, with the heavy losses sustained in the two preceding years, raises the debit balance at profit and loss account to £448,780. Assets, it is stated, have been written down to values ruling at the date of the balance-sheet, and the business is now on a paying basis.

SALAR DEL CARMEN NITRATE SYNDICATE, LTD.—It is announced that the directors purchased at the recent Government sales two additional plots of nitrate-bearing lands adjoining the existing properties. The purchase price, including incidental expenses, will amount to approximately £62,000, and this sum is being provided out of accumulated funds of the syndicate.

BRITISH PORTLAND CEMENT MANUFACTURERS, LTD.—It is announced that the reconstruction of the board has now been carried out, and the following directors have resigned:—Brigadier-General F. C. Stanley, Mr. Anthony White, Mr. Alfred Brooks, and Mr. G. E. W. Cranage. At a meeting held on September 18 the following were elected directors of the company: Mr. W. J. Firth, Sir James Allan Horne, Lord Meston, and Mr. P. J. Pybus. Mr. P. M. Stewart, who has hitherto held the position of a vice-chairman, has been elected chairman.

BRITISH GLUES AND CHEMICALS, LTD.—In their report for the year to May 31 last, the directors state that a basis of settlement of the company's taxation matters, so long is dispute, has at last been arrived at with the Inland Revenue authorities; the exact figures have not yet been agreed, but full provision is made in the accounts. The balance on the profit and loss account, subject to taxation, brought forward amounted to £78,469, and the net profit for the year, after due allowance for depreciation (£31,315) and bad and doubtful debts, to £6,294, making a total of £84,763. After deducting £76,000, provision for taxation liability to May 31, 1924, the balance of £8,763 is carried forward. The directors regret they cannot recommend the payment of dividends on the preference and ordinary shares. The annual meeting will be held at Cannon Street Hotel, London, E.C., on October 1, at noon.

Chemically Produced Sugar

REPORTS from America state that Dr. E. C. C. Baly, senior Professor of Chemistry in the University of Liverpool, has achieved one of the greatest scientific triumphs of modern times in making sugar in a way similar to that in which the green leaves of plants have been yielding it for ages. Dr. Baly, in an address on "The Mechanism of the Photo-synthesis of Sugars and Carbohydrates," given at a meeting of the American Chemical Society at Cornell University, said that he had made formaldehyde from carbon dioxide and water, and from this formaldehyde, with the aid of ultra-violet light, had made sugar. Principal Irvine, of the University of St. Andrews, has borne out by independent investigation the claim that the project evolved by Professor Baly is glucose sugar.

It has long been believed that the first reaction which occurs in a green leaf is the uniting of carbon dioxide and water to form formaldehyde. Professor Baly therefore exposed carbon dioxide and water to the intensely active ultra-violet light from a quartz mercury vapour light. He was then able to form slight traces of formaldehyde. The formaldehyde immediately formed sugar, and the sugar at the same time was retransformed into formaldehyde. The cycle was complete, and he had actually formed sugar without the intervention of living force. The amount of energy required is many hundred times greater than that for any reaction which has so far been commercialised.

New Chemical Trade Marks

Applications for Registration

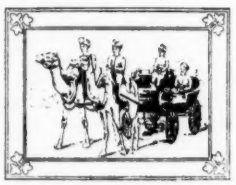
This list has been specially compiled for us by Mr. H. T. P. Gee, patent and trade mark agent, Staple House, 51 and 52, Chancery Lane, London, W.C.2, from whom further information can be obtained, and to whom we have arranged to refer any inquiries relating to patents, trade marks and designs.

Opposition to the registration of the following trade marks can be lodged up to October 24, 1924.

B444,504. For carbide of calcium, acetaldehyde, paraldehyde, aldehyde, ammonia and acetic acid, all being chemical substances used in manufactures. Shawingigan, Ltd., 83, Cannon Street, London, E.C.4; merchants. January 16, 1924. User claimed from October 20, 1919.

"ALFORM"

450,327. For disinfectants. Charles Henry Swire, Eric Charles Swire, and Frank Harland Swire, trading in co-partnership, 152, Queen's Road, Halifax; manufacturing chemists. July 18, 1924.



450,486. For raw, or partly prepared, vegetable, animal, and mineral substances used in manufactures. Class 4. Chemical Works, formerly Sandoz (a company incorporated according to the laws of Switzerland), 60, Fabrikstrasse, Basle, Switzerland; manufacturers. July 24, 1924. (To be Associated. Section 24.)

449,857. For chemical substances used in manufactures, photography, or philosophical research, and anti-corrosives. Chemical works, formerly Sandoz (a company incorporated according to the laws of Switzerland), 60, Fabrikstrasse, Basle, Switzerland; manufacturers. July, 3, 1924. (To be Associated. Section 24.)

Tariff Changes

FRANCE.—Alterations have recently been made in the classification of certain substances. The following are now classified for duty as *Chemical products not specially mentioned* (No. 0381).—Lysol or saponified cresol, decolorant for oils, greases, etc., with a base of animal black and of chemical products; residual products from the manufacture of lead containing caustic or other soda, sodium chloride and other salts coming from impurities in the metal; solvent or diluent with a base of amylic alcohol and of amyl acetate without ethylic alcohol; cement with a base of animal fat, of sulphate of lime, of iron oxide or other similar products; special white for glazing paper with a base of carbonate of lime and of sulphate of baryta precipitated and the like; synthetic extracts of chestnut and other woods.

Testing apparatus for laboratories or research work (kneaders, mixers, etc.) are now classed as *Instruments for laboratories and scientific research* (No. 634 *quat.*). Hydrated magnesia is now classed under *Calcined* magnesia (No. 0135), and precipitated phosphate of lime as *Pharmaceutical* phosphate of lime (No. 066). Hypophosphite of lime, hyposulphite, meta- and pyro-phosphate of lime and nitrite of lime now fall under *Other calcium salts* (No. 0110) and organic manure obtained by de-greasing wool as *Natural organic manure* (No. 39). Synthetic mentol is now classed as *Artificial* perfumes (No. 112 *bis.*).

UNION OF SOUTH AFRICA.—A Proclamation, dated July 22, 1924, imposes as from August 15, 1924, on carbonate of soda imported from Great Britain a dumping duty equal to the difference between the price at which carbonate of soda of a like grade is sold for home consumption in Great Britain, plus the f.o.b. charges, and the selling price f.o.b. to the importer in the Union, provided that the dumping duty shall not in any case exceed 25 per cent. *ad valorem*, and that the duty shall not apply to carbonate of soda which was exported to the Union from Great Britain prior to August 15, 1924.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that occur.

Mortgages and Charges

*[NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.]*

CLEMENT AND JOHNSON, LTD., London, W.C., chemists. (M., 27/9/24.) Registered September 11, £60,000 2nd debentures and premium on redemption of 25 per cent. (filed under sec. 93 (3) of the Companies (Consolidation) Act, 1908), present issue £2,150; general charge. *£57,100 1st mortgage debentures. January 31, 1924.

PELICAN MILLS CO., LTD., Manchester, chemical manufacturers, etc. (M., 27/9/24.) Registered September 11, £200 debenture, to A. Pettitt, Eden Terrace, Glebelands Road, Ashton-on-Mersey, printer; general charge. *Nil. February 13, 1924.

Receiverships

DIAMOND SODA CO., LTD. (R., 27/9/24.) W. R. Graves, of 17, Coleman Street, E.C.2, was appointed receiver and manager on September 16, under powers contained in second and third mortgage debentures dated March 28 and April 28, 1924.

PARTON, SON AND CO., LTD. (R., 2719/24.) O. W. Thompson, of Bank Chambers, 11, Waterloo Street, Birmingham, was appointed receiver and manager on September 11, under powers contained in debenture dated June 11, 1924.

London Gazette, &c.

Notice of Intended Dividend

CARRERAS, Alfonso, and CARRERAS, Enrique, trading as A. and E. CARRERAS (a firm), 207, King Street, W.6, London, tooth paste manufacturers. Last day for receiving proofs, October 2. Trustee, D. Hart, 23-25, Maddox Street, London, W.1.

Partnerships Dissolved

BARRATT BROTHERS (Harry Sheldon BARRATT and Charles William BARRATT), paint and varnish manufacturers, Lower House Mill, West Bollington, near Macclesfield, by mutual consent as from September 15, 1924. Debts received and paid by H. S. Barratt.

FARINOL COMPANY (Walter James SABLE and Wilfrid Osborne PALMER), manufacturing chemists, Westinghouse Road, Trafford Park, Manchester, by mutual consent as from August 30, 1924. Debts received and paid by W. O. Palmer.

New Companies Registered

AUTOMATIC BOTTLE MACHINE CORPORATION, LTD., 12-13, Henrietta Street, Strand, London, W.C.2. Manufacturers of all classes of machinery used in the Manufacture of glass and glassware, etc. Nominal capital, £1,500 in 1,000 7 per cent. cumulative preference shares of £1 and 10,000 ordinary shares of 1s.

DAVIES, WHITEBIRK, LTD., Whitebirk, Blackburn. Manure manufacturers; fat, tallow bone and wool brokers,, tanners, bone boilers, fat melters, etc. Nominal capital, £2,000 in £1 shares.

DIGGORY AND CO., LTD., 81, Dale Street, Liverpool. To acquire the business of manufacturers, exporters and dealers in coal-tar by-products, etc., as carried on by H. S. Diggory and A. H. Diggory at 81, Dale Street, as Diggory and Co. Nominal capital, £3,000 in £1 shares.

HERBERT GEORGE (MANCHESTER), LTD. Dyestuffs and chemical merchant. Nominal capital, £20,000 in £1 shares. Solicitors: Skelton and Co., 90, Deansgate, Manchester.

ALFRED H. PARTRIDGE, LTD. Candle makers, soap manufacturers, wax bleachers, stearine makers, and ozokerite refiners, etc. Nominal capital, £25,000 in £1 shares. Solicitors: Piesse and Sons, 15, Old Jewry Chambers, London, E.C.2.

PAYZU SOAP CO., LTD., 43, Church Road, Brixton, London, S.W. Soap manufacturers. Nominal capital, £1,500 in £1 shares.

J. L. ROSE, LTD., Chemical works, Abbey Road, Barking, London, Manufacturers of gallic acid and pyrogallic acid, etc. Nominal capital, £10,000 in 6,000 7 per cent. cumulative preference shares, 3,800 ordinary and 200 deferred shares of £1 each.

SWIFT FIRE EXTINGUISHERS, LTD., 2, Mann's Court, Kirkgate, Bradford. To acquire and exploit certain patents for inventions relating to fire extinguishers, and to carry on the business of wholesale drysalters, exporters and manufacturers of and dealers in chemical, industrial and other preparations. Nominal capital, £1,000 in £1 shares.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Oversaas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

CHEMICALS FOR THE NETHERLANDS.—The Department of Colonies is inviting tenders for zinc plates, zinc white, caustic soda, borax, naphthalene, yellow ochre, white soap, sal-ammoniac and wood spirit. Tenders must reach the Director of the Kolonial Etablissement, Westerdvksdijk, Amsterdam, not later than October 1. Certain of the documents (in Dutch) in connection with these tenders can be seen at the D. O. T. (Room 84).

SCIENTIFIC INSTRUMENTS FOR NEW ZEALAND.—Apparatus for research in bacteriology, biology, physiology, pathology, chemistry, agriculture, embryology, protozoology, zoology, histology and general industrial research; photographic materials, cameras and chemicals, are required, and British manufacturers of this apparatus can obtain the name of the inquirer upon application to the D. O. T. (Reference No. B.X. 1236).

PHOTOGRAPHIC CHEMICALS.—A travelling representative having a long acquaintance with the Indian market is desirous of obtaining the representation of British firms interested in photographic chemicals, plates, papers, etc. (Reference No. 318.)

CHEMICAL SUPPLIES.—An agent, established at Liege, is desirous of obtaining the representation of British manufacturers, on a commission basis, for the sale in Belgium of all medical, pharmaceutical and druggists' supplies. Also industrial chemical products. (This is a repetition of a notice in the "Journal" of August 14. (Reference No. 328.)

PHARMACEUTICAL CHEMICALS.—A firm of commission agents in Algiers desire to be put in touch with British exporters of pharmaceutical chemicals including salts of bismuth, salts of quinine and iodide of potassium. Firm states that their sales of these commodities amount to several million francs per annum. (Reference No. 338.)

AGENTS' SERVICES OFFERED.—An important firm of soap and chemical manufacturers and wholesale dealers in chemical products and pharmaceutical specialities in Sao Paulo is desirous of extending its import trade, and of securing the representation of British firms for the sale of the above classes of goods in Brazil. (Reference No. 344.)

The World's Soap Markets

THE demand for toilet soaps in Algeria is fairly considerable and warrants much more attention on the part of the British manufacturer, says the *Manchester Guardian Commercial*. The large French firms appear to be ousting all competitors, but British firms prepared to adopt enterprising advertising should obtain good results.

An early revival of the British soap trade with Bulgaria is anticipated. There is no demand for soft soap and soap powder other than British, and the bulk of the soap sold is British. Greece is a promising market. There is no market for laundry soaps, soap powders, or soft soap, but disinfectant soap is imported in considerable quantities.